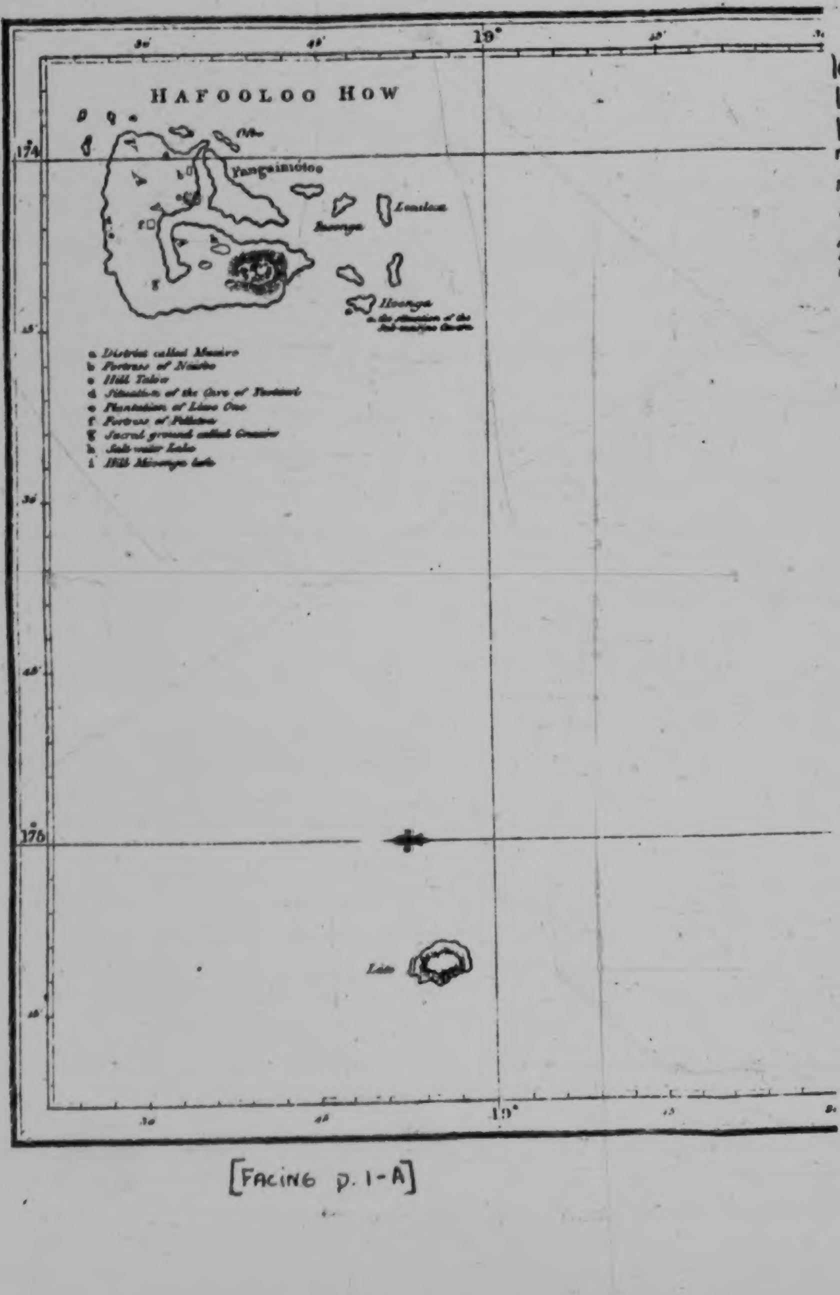
2: Mariner F-5 (1806-1810) 1818 OU9 Tonga OU9


HAFOOLOO HOW
30'
40'
19°
50'
174
15'
30'
45'
175
Ofoo
Yangeimotoo
Loouloo
Isuoonga
Hoonga
the situation of the Sub-marine Cavern
Late
a District called [illegible]
b Fortress of [illegible]
c Hill Talow
d Situation of the Cave of [illegible]
e Plantation of [illegible]
f Fortress of [illegible]
g Sacred ground called [illegible]
h Salt-water Lake
i Hill [illegible]

102
131
133
712
778
241
285
721

[FACING p. 1-A]

2: Mariner F-5 (1806-1810) 1818 OU9 Tonga OU9

102
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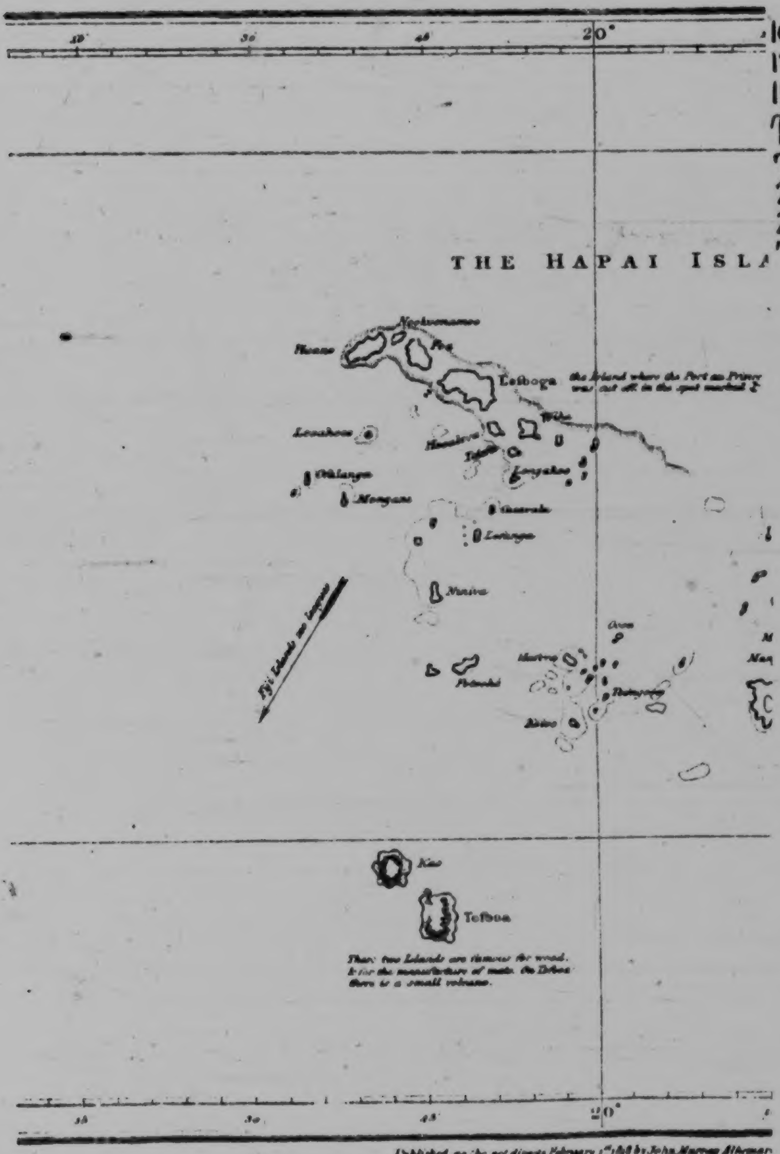

20°
THE HAPAI ISLA
Foa
Lefooga
the Island where the Port au Prince was cut off in the spot marked
Kao
Tofooa
These two Islands are famous for wood, & for the manufacture of mats. On Tofooa there is a small volcano.
20°

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[FACING P. 1-B]

102
133
131
712
778
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285
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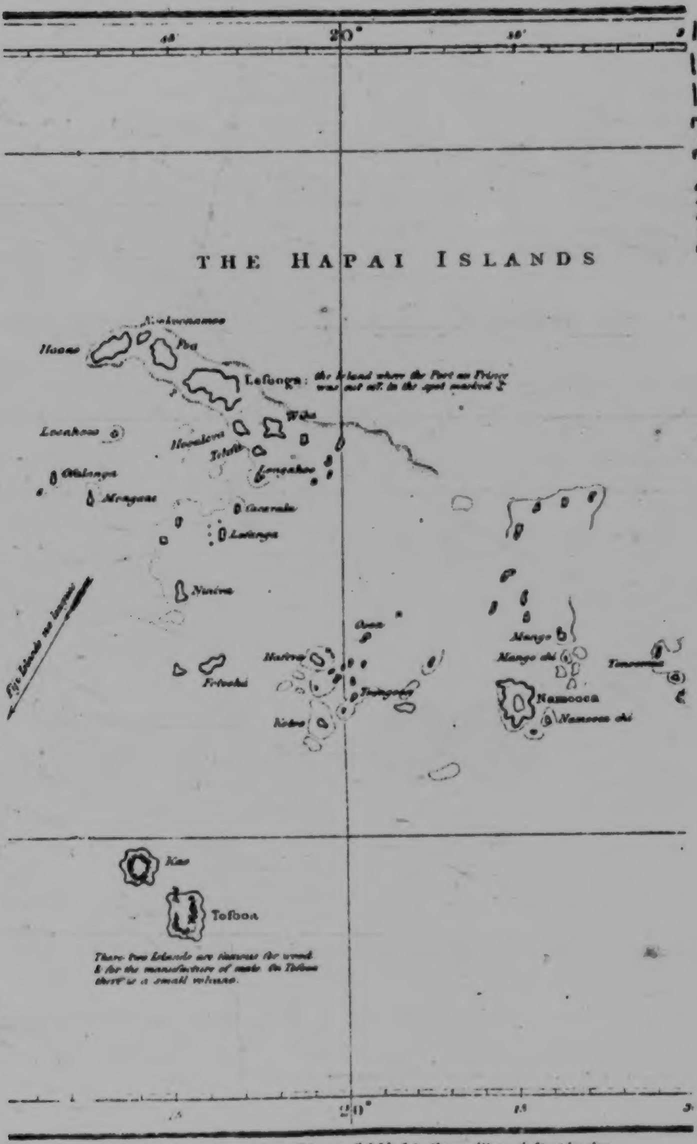

40'
20°
10'
THE HAPAI ISLANDS
Hoono
Foa
Lefooga
Loofanga
Otolonga
Nuviva
Kotoo
Mango
Mango chi
Namooca
Namooca chi
Kao
Tofooa
20°

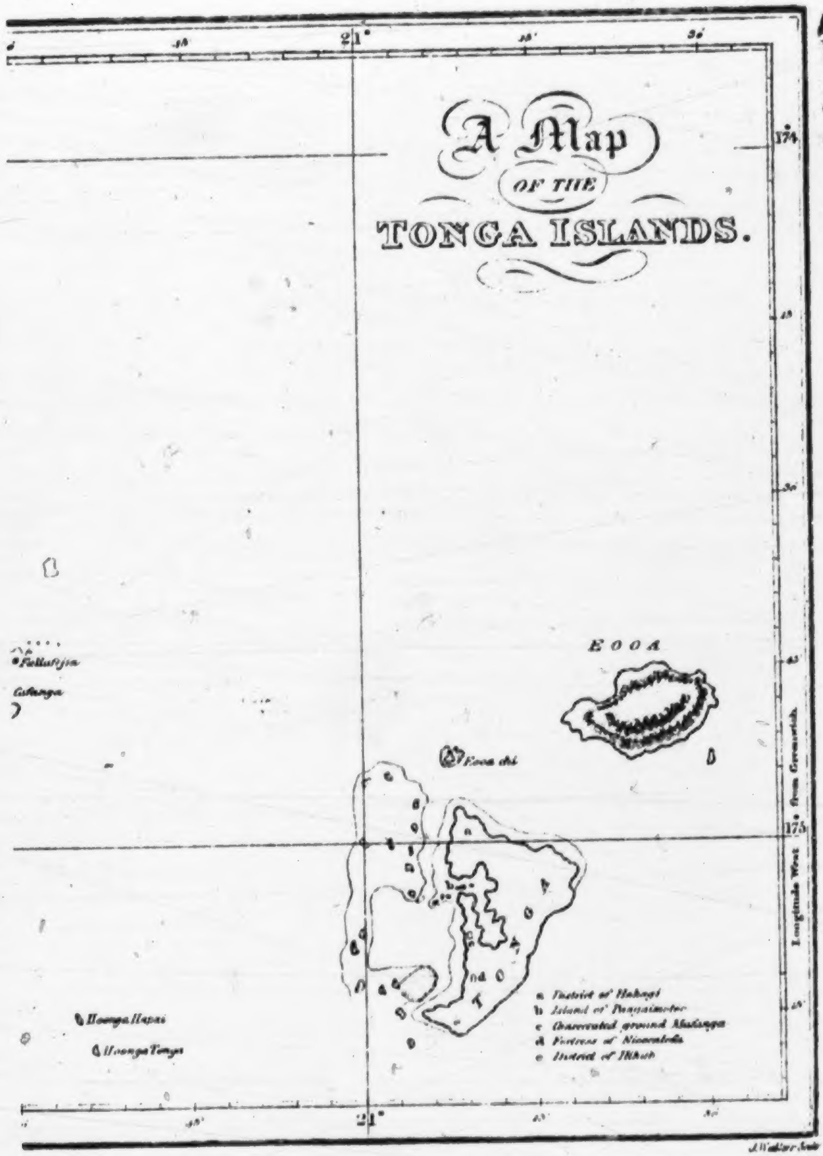
Lefooga: the Island where the Port au Prince was cut off, in the spot marked ‡

These two Islands are famous for wood & for the manufacture of mats. On Tofooa there is a small volcano.

Published as the act directs February 1st 1818 by John Murray Albemarle Street London.

[FACING P. 1-C]

2: Mariner F-5 (1806-1810) 1818 OU9 Tonga OU9


A Map
OF THE
TONGA ISLANDS.
21°
30'
174
175
Longitude West from Greenwich
EOOA
Eooa chi
Fallafajea
Onelangi
Hoonga Hapai
Hoonga Tonga
a District of Hahagi
b Island of Pangaimotoo
c Consecrated ground Mafanga
d Fortress of Nioocalofa
e District of Hihifo
J. Walker Sculp.

102
131
133
712
778
241
285
721

[FACING p.1-D]

765 Finow, having finished his speech, arose and
634 went to his house, accompanied by the sons of
[537] his chiefs and matabooles, who, together with
his warriors, formed his retinue. After a re-
765 634 past, provided beforehand*, he again made an
829 address, but in a more familiar and conversa-
537 tional way, on the advantages of cultivating
241 land for one's own food, and eating the produce
[574] of one's own labour; and to strengthen his argument, he observed, that, hitherto in Tonga, it had been the custom for those who formed the retinue of chiefs to subsist on the provision which those chiefs thought proper to share out to them from their own store: and during the great famine (which happened many years before, while he was yet but a boy), he had remarked that more of these men (chiefs' dependents) had died than of the lower orders, who tilled the ground for their own support, as well as that of their chiefs, because they always found means to reserve food for themselves, however great might be the tax; while those who depended on the bounty of their chiefs got but a very scanty allowance. He then went on, "You do not know how much pleasure such

---

[276] * They often have cava parties where little is eaten, which was the case with that where he made the above speech; those who are fond of cava seldom eat much with it, conceiving that food destroys its genuine taste, and prevents its due effect upon the system.

2: Mariner F-5 (1806-1810) 1818
OU9 Tonga OU9

" men feel when they view the work of their 765
" own hands thriving daily: and, whilst eating, 634
" when they reflect that their labour has been 829
" repaid by the increase of their stores: there- 537
" fore let us (chiefs and attendants of chiefs) 241
" apply ourselves, as we have nothing else to " do, to agriculture: follow my example; I " will order a piece of ground to be cleared, " and, during the next rain, I will assist in " planting it with *hiabo*."

No other circumstances worthy of note hap- 765
pened during the twenty days concluding the 634
burial ceremony. On the tenth day, those who [292]
were not relations of the deceased, nor constituted his household, wore a sort of half mourning; that is to say, under their mats they wore a piece of *gnatoo*, not to be seen, but merely to be more comfortable to the skin than the mats, which, on these occasions, are not of the finest
texture. After the twentieth day they wore [291]
their ordinary dress, and went to their proper
habitations; so did also the relations of the de- [292]
ceased, but then these wore mats for about two months afterwards, though with *gnatoo* under them.

We now come to speak of the transactions of the twentieth day, which concludes the whole ceremony.

Early in the morning of this day, all the rela-

634 timents of these young chiefs, to prevent the
discontent and disturbance which might other-
486 wise take place. The canoe was now ordered
661 to leave Vavaoo for the last time, and never
357 more to return, for if she or any other canoe should again make her appearance from Hapai, her approach would be considered hostile, and proper measures would accordingly be adopted. At this moment, the women on the beach earnestly petitioned Finow to be allowed to take a last farewell of their dear and beloved mistress, which on being agreed to, nearly two hours were taken up in this affecting scene.

634 From this time Finow devoted his attention
to the cultivation of the island; and the exer-
241 tions of this truly patriotic chief were so far suc-
712 cessful that the country soon began to promise the appearance of a far more beautiful and cultivated state than ever: nor did he in the mean time neglect those things which were necessary for the better defence of the place, and accordingly the fortress underwent frequent examination and improvements.

In the midst of these occupations, however, a
578 circumstance happened which might have been
[577 the cause of much civil disturbance. It is well
worth relating, as it affords an admirable cha-
128] racter of one of the personages concerned, and shews a principle of honour and generosity of

mind, which must afford the highest pleasure 578
to those who love to hear of acts worthy the 577
character of human nature. On one of the 128
days of the ceremony known by the name of
tow tow *, which is celebrated on the malái, 578
with wrestling, boxing, &c., a young chief, of 526
the name of Talo, entered into a wrestling- [796]
match with Hala Api Api (the young chief who,
as may be recollected, was mentioned on the
occasion of Toobó Nuha's assassination). It
should however be noticed, that a few days before,
these two had held a debate upon some
subject, in which neither could convince the
other. It is usual on such an occasion, to prevent
all future fruitless argument upon the same
topic, to settle the affair by wrestling: not that
this mode is considered in the light of a knock-down
argument, perfectly convincing in its nature,
but it is the custom for those who hold a
fruitless contention in argument, to end the
affair the next opportunity, by a contention in
physical strength, after which the one who is
beaten seldom presumes to intrude his opinion
again on the other, at least not upon the same
subject. Hala Api Api therefore challenged
Talo on the spot. For a long time the contest

---

* An offering to the god of weather, beginning at the time [782]
when the yams are full grown, and is performed every tenth [241]
day for eighty days.

ful veneration, that amounted to what was little 634
short of idolatry; for finding that Mr. Mariner 177
could not explain why it always pointed more or 727
less to the north, he could hardly be persuaded 484
but what it was inspired by a *hotooa*. He was 502
so pleased with this property of the compass, that he almost always carried it about him afterwards: using it much oftener than was necessary both at sea and on shore, for it always seemed a new thing to him.

It may easily be supposed, that Finow, with 634
such an inquiring mind as he possessed, took 157
delight in every thing that afforded him instruction, or satisfied his curiosity; not only in regard to things that were very extraordinary, but those also that were moderately common and useful. He was accustomed, therefore, to visit the houses of canoe-builders and carpenters, that he might learn their respective arts, and he often made very judicious observations. He very frequently 634
went into the country to inspect the 157
plantations, and became a very good agriculturist, 241
setting an example to all the young chiefs, that they might learn what was useful, and employ their time profitably. He used to say, that the best way to enjoy one's food was to make oneself hungry by attending to the cultivation of it.

There were many individuals at the Tonga 634
157

The remaining professions are followed both
by mooas and tooas, with the exception of the 555
three following, viz. *toofoonga fy cava* (barbers 461
or shavers with shells), *tangata fe oomoo* 565
(cooks), and *ky fonnooa* (peasants), all of whom 305
are tooas. 252

Of the different professions, some are hereditary 241
in the way before mentioned, and some are 305
not; the latter consist of *toofoonga ta tattow* 322
(those who perform the tattow), *toofoonga tongi acow* (club carvers, or engravers of the handle, not inlayers); and *toofoonga fy cava* (barbers). The arts followed by these are not hereditary, for they are not of that respectability to engage a man to follow any of them because his father did the same: they are practised by any one who has a natural turn that way.

But the two lowest of all, viz. the cooks and 555
peasants, are such by inheritance, for the chiefs 461
in whose service they may be necessarily re- 565
quire their services, and their children naturally 252
succeed them, for neither of these arts require 241
any great talent to learn; every body knows how to cook and till the ground in a tolerable degree; but those who are born to no better fate have no alternative left them, they must follow these necessary employments as the business of their life, if their chiefs command them; and to such alone the terms cook and peasants are here applied. The cook is some- 357

555 what the superior; he sees to the supplying of
461 provisions, takes care of the store-house, looks
565 to the thatching and fences of the dwelling-
house, occasionally gives an eye to the plantation,
252 and sometimes works upon it himself. The
[241] head cook is generally not a little proud of
[357] himself, and is looked on with some respect by
the cooks below him and the common peasants.

The term cook is frequently applied to a man though he be not a cook, to signify that he is of very low rank: for although a cook belonging to a chief may give himself many airs, and be thought something of by the common tooas about him; yet if there be a company of peasants together, he that has the least to boast of in respect of family connexions is sure to be made the cook, and as it were servant to the rest.

The following then will be the order in which
555 the different professions will stand as to the re-
461 spect they may command in society:—all in-
565 dividuals are not, however, esteemed according
to their profession, but according to their abilities in it; for a clever man in one art will be sometimes more esteemed than a man of mo-
[252] derate abilities in a higher. In this arrange-
[241] ment the cooks are placed before the peasants, because the cooks of chiefs generally have to overlook them.

Hereditary.	*Toofoonga fo vdca;* canoe-builders.	Followed both by *mataboolees* and *mooas.*	555 461
	Toofoonga fono le; cutters of whale-teeth ornaments.		565 [396]
	Toofoonga taboo; superintendants of funeral rites.		[306]
	Toofoonga ta maca; stone-masons, or makers of stone vaults.	Followed both by *mooas* and *tooas.*	[767] [324]
	Toofoonga jia cobenga; net-makers.		[286]
	Toofoonga toty ica; fishermen.		[226]
	Toofoonga langafalle; large house-builders.		[331]
Hereditary or not.	*Toofoonga ta tattow;* those who perform the tattow.		[305]
	Toofoonga tongi acow; club-carvers.		[322]
	Toofoonga fy cava; barbers or shavers with shells.	Followed only by *tooas.*	[306]
Hereditary.	*Tangata fe oomoo;* cooks.		[252]
	Kyfonnuoa; peasants.		[241]

Property in these islands, as may easily be conjectured, consists principally in plantations, houses, and canoes, and the right of succession to it is regulated by the order of relationship, as given under the head of Nobles, p. 88, so in like manner is the right of succession to the throne. 421 428

Having now given a view of the rank of individuals in society, with reference to religion, civil government, and professional occupations; we have now to consider it in respect to old age, sex, and childhood. 128

Old persons of both sexes are highly reve- 888

776 the king's family, but very frequently by Tóe
634 Oomoo. He[A] has a large consecrated fencing
at Ofoo, one of the islands in the vicinity of
778 Vavaoo: he has, at least, one priest, and is
793 very frequently consulted in behalf of sick persons.
787

755 A'lo A'lo; literally, *to fan*. God of wind
and weather, rain, harvest, and vegetation in
776 general. This god is generally invoked about
821 once a month, if the weather is seasonable, that
it may remain so; if the weather is unseasonable,
or destructive on shore by excessive wind
or rain, he is invoked every day. A'lo A'lo is
not the god of thunder and lightning, of which,
indeed, there is no god acknowledged among
them, as this phenomenon is never recollected
to have done any mischief of consequence. In
boisterous weather at sea, the superior god
Toobo Toty', the protector of canoes, and other
sea gods, are always invoked in place of A'lo
776 A'lo. About the time when the yams are full
796 grown (near the latter end of December), the
ceremony of *tow tow* begins, consisting in an
241 offering of yams, and other provisions, to the
god A'lo A'lo. This ceremony is repeated every
ten days, for eight times successively, as will be
described under the head of religious rites.
776 This god has only two houses dedicated to him,
778 one at Vavaoo, and the other at Lefooga: he
793 has also two priests, one at each place.

A [the god Ala'i Va'loo--Analyst]

that young superior chiefs have, for the most 565
part, old matabooles, and, as they grow older, 621
they begin to have younger matabooles, who 622
succeed their deceased fathers. 624

In respect to the *tooas*, they may be sub-
divided into three ranks, viz. those few who 565
are warriors, and are part of the *cow-tangata* of 241
chiefs; those who are professed cooks, in the [701]
service of chiefs; and those who till the ground. [252]
The latter live entirely in the country with their wives and families, and occupy themselves wholly in cultivating the land: their wives and daughters make gnatoo, mats, &c., but never till the ground, nor do any hard work.

The natives of Fiji, Hamoa, and the Sand- 462
wich islands, who were resident at Tonga, used
to say that it was not a good practice of the 562
people of the latter place to let their women 171
lead such easy lives; the men, they said, had enough to do in matters of war, &c. and the women ought therefore to be made to work hard and till the ground: no, say the Tonga men, it is not *gnale fafine* (consistent with the feminine character) to let them do hard work; women ought only to do what is feminine: who loves a masculine woman? besides, men are stronger, and therefore it is but proper that they should do the hard labour. It seems to be a peculiar trait in the character of the Tonga

REMARKS ON THE GAZETTEER

In compiling the list of Tongan place names, the following information, 128 when available, is recorded: (1) the feature to which the name is applied; (2) the group of islands in which the feature occurs; (3) the island on which the place is located; (4) the village near which it is located; (5) the name of the landlord; (6) the meaning of the name; and (7) miscellaneous data.

102
361

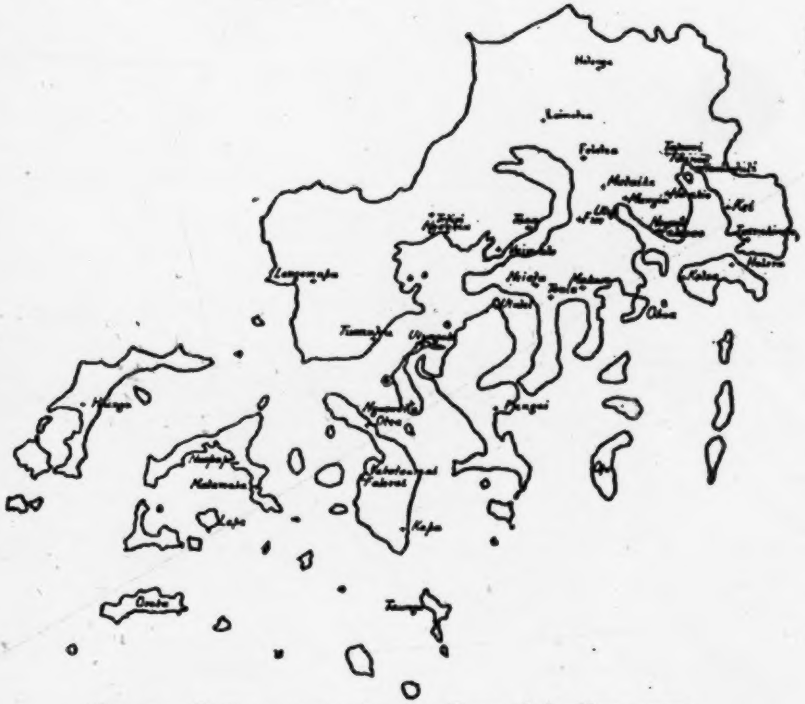

Holonga
Leimatua
Feletoa
Mataika
Neiafu
Longomapu
Tuanuku
Koloa
Okoa
Pangai
Hunga
Nuapapu
Matamaka
Falevai
Kapa
Ovaka
Taunga
Otea

FIGURE 1.—Outline map showing the villages of the Vavau group.

In the Gazetteer the largest number of names are of tracts (*api*) and 103
village tracts (*apikolo*) and were obtained from the Tongan land office [127]
records. The tracts are the farm lands of the population, and each tract [423]
listed is today held by a Tongan tenant. Most of the tract names seem
to be ancient. Not so the village tract names, many of which are of for- 361
eign countries; for village life in Tonga is only a century and a quarter 178
old, the population formerly dwelling scattered over the land. Civil war, [103]
[241]

convenience in attending frequent church services, and the copra trade are 361
probably the chief factors responsible for the growth of the villages and 178
for the degeneration of agriculture. Today the Tongan resides in a village 241
from which he makes the necessary excursions to his farm. Anciently he resided
on the farm (*api*) and there were no villages. Needless to say, the
extent of cultivated land is much diminished.

Too much faith should not be placed in the meanings of place names 103
listed. The average Tongan appears to give no more thought to the meaning 128
of his place names than we do. If asked what a name means, it is
an even chance he will not know. The meanings of almost all place names [127]
in this paper were worked out by Tongan scholars, European and native.
These meanings have all been studied by the author and modified where
it seemed necessary. Nevertheless, some meanings are undoubtedly forced,
and, what is more, it sometimes happens that a name is open to more than
one interpretation.

Even with these short-comings in mind it is apparent that the meanings 103
of names fall roughly into two great classes, descriptive and commemorative.
The former refer to some feature of the locality, the latter to some
event, usually trivial enough. There are also names of foreign places.
Undoubtedly when comparison with other regions is made these will
increase many fold. Apparently some names express in sarcasm or 423
irony the injured feelings of the tenant of the tract, for it must be remembered [103]
that land is not owned by the rank and file of the population.
It is leased from the government and from the nobility, there being in all
some thirty such landlords. The rentals paid today in coin replace the
ancient tribute of produce paid to the lords of the land.

The name of the landlord has been recorded for every tract; the [128]
absence of a personal name signifies that the government is the landlord.

So far as Tonga alone is concerned, the names of the landlords appear 174
of slight significance in solving the problem of Tongan origins. Here and 103
there a place name appears definitely associated with a landlord, as the
place name Haatalafale with the landlord Tui Pelehake. I believe, however, 121
that the recording of the landlord names will prove exceedingly
valuable when comparisons are made with other parts of Oceania.

In the gazetteer the several occurrences of a single name are listed 128
from the Tongatabu group in the south to Niuafoou in the north. Roughly
the order of listing the occurrences on several islands in a group, or near
several villages on an island, is from south to north and from west to east.
The reason for selecting the southern or Tongatabu group as the starting
point is the fact that it seems always to have been the political and
cultural center of the Tongan kingdom. The names of the five groups of 104

2. **Api faa toe tuu ai ae teve:** In the well-stocked farm still stands the *teve*. 539 262

The *teve* (Amorphophallus) grows wild in the bush. Its root has an acrid taste, but is nevertheless sometimes eaten in periods of scarcity. The true farmer, however well stocked he is with other food plants, will not neglect this unpalatable shrub which will be a stand-by in case of the failure of his other crops.

3. **Fakamotua ke tao ha tua:** Playing the old man to bake a *tua* (a fine kind of yam).

The *tua*, in addition to being a specially good sort of yam, is also one of the hardest varieties to cultivate, and the man who can grow them well is obviously a real farmer. This phrase is a rebuke for a lazy man. Do you expect that sitting down with folded hands like a decrepit ancient is the way to get these fine yams to bake and eat? [244] [626]

4. **Halahala a maala koli:** Misses of well cultivated garden, that is, a yam garden in which the soil is loosened to a good depth and where fine large pieces of seed yam are used. 539 244

In such a plantation there may be some holes which miss, but those which do grow well will have such large roots as to compensate for the failures. Applied especially in such sports as boxing, fishing and the like, to one who may fail often to get his blow home, or to catch any fish, but when he does succeed scores so heavily as to redeem his previous failures. [526] [226]

5. **Holi ke utuutu i he maala utu:** To desire to glean in a plantation that is being harvested.

Utuutu is to look for yams in the bush growing wild on the sites of disused gardens. What one finds in this way he is welcome to, but such gleaning must not trespass on gardens which are still being used by their owners. [423]

6. **Huo hoko hoka huo:** Digging together, spades clashing.

If two men are working close together and one strikes his spade against his companion's the accident is likely to prove annoying and lead to a quarrel. The expression, therefore, is an injunction to keep strictly to the line of one's own job without irritating interference with neighboring laborers. 539 578 461

7. **Kaka tuu ofi:** Barren soil near at hand.

An inferior piece of ground conveniently close is more likely to be cultivated than better soil at a distance. The thing of fair quality that is near is better than a superior thing at a distance. A bird in the hand is worth two in the bush. 539 241

539 **8. Nae hanga ki fe hoo sipeiti:** Where was your spade turned,
461 that is, what has your spade been turned towards?
829 This is the usual retort to one who begs that which he should have prepared for himself. It refers primarily to the produce of the garden but is used of wealth generally. The word *sipeiti* is not Tongan, but a corruption of the English "spade." Whether, before contact with Europeans, there was a similar expression with the real Tongan word for a spade or digging-stick, we are unable to say.

539 **9. Matenga i vao kaka:** Fatigue in barren soil.
241 The word *vao* signifies a piece of scrub land. The husbandman in
461 preparing for his garden selects a site and clears the brush. This expression is applicable to one who undergoes the labor and fatigue of clearing and planting a piece of land that proves unfertile. It is labor in vain.

539 **10. Ne ongo e fena ka ko Nua:** Although she has sprouted yet
173 *Nua.*
643 An early Tui Tonga sent to the chief Loau for one of his daughters.
581 Instead of asking outright for the girl the Tui Tonga's messenger was instructed to ask Loau for yams. Possibly the messenger himself did not know the purport of his errand but Loau at once understood, probably from previous agreement between himself and the Tui Tonga. Loau had two daughters, the younger not yet of marriageable age, the other named Nua, had recently borne a child. Loau, therefore, still in the language of the yam crop, returned answer to the Tui Tonga that one part of the crop was not yet ripe, and that the other part had already sprouted, using the word *fena,* which means a piece of seed yam which has been planted and commenced to grow. The Tui Tonga replied as above, meaning of course that although Nua had borne a child to someone else yet he still wanted her, for she was a very beautiful woman.

11. Oku fena ae tau kei mula ae tau: The crop is sprouting, the crop is still unripe.

As explained in No. 10, the reference is to the answer of Loau to the Tui Tonga, who sent for one of Loau's daughters. One is over-ripe, and the other is not ripe enough.

539 **12. Paki moe talaha:** Pick the remainders too.
245 In the breadfruit tree all the fruit do not ripen together, and so in plucking the crop the ripe fruit will be taken and the others left to mature. This expression means to strip the tree bare of unripe as well as of ripe fruit.

539 **13. Pala a kahokaho:** Rottenness of the *kahokaho.*
244 The *kahokaho* is a species of yam which grows to a great size and is
622 highly valued. It is a chiefly yam, that is, one especially suitable for presentation to a chief. Even if this prime vegetable has commenced to decay yet it is a *kahokaho,* and something better than the best specimens of many other kinds of yam. Besides what may be called its ethical qualifications due to its rank in the yam hierarchy it is a physically fit tuber, as the remainder of the flesh is not affected by the beginnings of decay.

12: Vason M-3 (1797-1801) 1810
OU9 Tonga OU9

175 regularly espoused ; and at my request, Mulkaa-
797 mair sent for her again.

My chief gave us a habitation near his own.
Here I brought all I had, and gave her equal possessions with myself. We lived here together, for some time, in much comfort. I daily advanced in the knowledge of the language, and such prospects of success now opened upon me, that I determined to finish my days in Tongataboo.

Ambition of distinction and the desire of wealth now began to excite me to exertion. I employed my thoughts in devising plans to provide a comfortable settlement in the Island, and became very desirous of a portion of land to myself, that by my own industry, I might render myself independent.
175 At this time a neighbouring chief wished to dispose
425 of a tract of land ; my chief, Mulkaamair, purcha-
797 sed the estate for me, with a spade, an ax, a small
native canoe, and a couple of knives. This was
435 the whole price given for the purchase of the abbee,
175 or farm of Omataanee. It contained about fifteen
acres, and was separated from the estate of Mulkaa-
797 mair by a lagoon or arm of the sea, a quarter of a
mile across. This I crossed the next day, to enjoy the new delight, never before experienced, of
[361] viewing an estate of my own. With what joy did
[241] I contemplate its little pendent groves of cocoa and
plantain trees, and its smooth lawns, diversified by
little habitations, which contained the peaceful

12: Vason M-3 (1797-1801) 1810
OU9 Tonga OU9

natives, who now became my subjects and labourers 175
to cultivate my fields for their own subsistence 797
and mine! I visited them, and informed them I
wished that they would remain with me: but they [361]
were timid, and appeared unwilling to stay, on account [241]
of the ill usage which other natives had met
with from the Europeans, before mentioned, whom
they served. I encouraged them by kind words
and behaviour, and at length prevailed upon them
to continue with me.

It may appear surprising that an estate so small as 175
fifteen acres should contain the cottages of labourers: 361
but it should be considered that Tongataboo 241
was throughout cultivated like a garden, and that
the cocoa-nut and plantain trees, upon a small extent
of ground, were sufficient to support many inhabitants.

My little domain was bounded, on one side, by 175
the channel, before mentioned, which was a quarter 797
of a mile across, and separated it from Mooa;
my former residence. I received supplies of provisions [241]
from Mulkaamair, and set about the cultivation
of my little territory with all possible diligence:
planted cocoa, and plantain trees with the
assistance of my tenants, and hoped, ere long, to eat
of the produce of my own industry.

Omataanee was not far from a fallee, or mansion 175
of Dugonagaboola, the principal chief, at which 643
he occasionally resided. Betwixt him and Mulkaamair, [644]
there always subsisted a jealousy; for [634]

E

12: Vason M-3 (1797-1801) 1810
OU9 Tonga OU9

These dances were performed with admirable 175
skill. Every possible motion and inflexion of the 535
body was made with a uniformity and rapidity, 585
which the torpid limbs of Europeans could not, except after a very long course of exercise from earliest youth, imitate. The utmost order and decorum prevailed throughout this festive exhibition of agility and joy: which terminated only with the dawn.

After amusing ourselves for many days, on this 175
Island, and receiving the most friendly attentions 797
from the chiefs, Mulkaamair's son fixed a period
for our return; and a number of canoes assembled 404
to accompany us.

At day-break, we took leave of the old chief, whom we had visited, and his young female relation, whom I had espoused, and sailed off for Tongataboo, which lay at the distance of sixty or seventy miles. The canoes sailed at the rate of six or [501]
seven miles in an hour, and brought us to the shores of Tonga, in the evening; where we all repaired to our respective districts.

I was charmed on my return, with the flourish- 175
ing appearance of my plantation. The bread-fruit, 241
cocoa, and plantain trees had already shot forth [797]
branches, which promised, ere long, to cast around them a friendly shade. Some bread-fruit trees, almost as large as the oak, had indeed spread their sheltering arms, for years, near the spot where I built my fallee; and now their fruits hung in clus-

175 ters amongst the branches ; some as large as a boy's
241 head, full grown, and exuding a gum ; others turned yellow, through ripeness, and the gum dried up.
175 These fruits[1], when cut into four parts, and baked
262 like potatoes in the fire, in a kind of oven, formed a
[252] good substitute for bread, while the ripe cocoa-nuts supplied me with both meat and drink of a delicious flavour, and the plantains furnished me with
175 a refreshing desert after dinner. The oven which
252 they use, is a hole dug in the ground, the sides obliquely sloped. In this they kindle a fire, on which they place some stones ; as soon as these are red hot, they draw the burnt sticks from under them, and, spreading the stones, place their provisions on them. They then lay some sticks prepared for the purpose across the hole to keep it hollow, and cover them with plantain and other broad and long leaves ; on which they heap grass and sods, to confine the heat. In this manner their provisions are cooked in the course of half an hour. I have seen a pig of the weight of fourteen or sixteen stone sufficiently baked in one of these ovens, in the space of four hours.

The rows of sugar canes which I had planted
175 on each side the path, leading to the high road, had
797 shot up to the height of eight or ten feet ; and now
241 they embowered and entwined themselves so as to
249 form a shady walk. I had improved upon the method of planting them, usual with the natives,

1 [i.e. breadfruit--Analyst]

12: Vason M-3 (1797-1801) 1810
OU9 Tonga OU9

They cut the stalk of a cane into two or three pieces, 175
and planted them nearly upright in the ground ; 197
these shot forth stems at the lower knots, but decayed 241
at the top. I planted them lengthways, in 249
furrows, and thus succeeded in obtaining suckers
from every knot.

By this expedient, my plantation of canes so increased
after a time, that I had abundance for my
own use, and for presents to my friends. My little 175
farm was a garden throughout. Many came to 197
offer themselves for workmen, as my land was free
from the "fadongyeer," or tax on labour, and my 241
labourers met with kind treatment. I willingly received [464]
them, as I took much pleasure in agriculture; [651]
and the chiefs perceiving my industry and
success, and entertaining a friendship for me, gave
me permission to cultivate lots of land adjoining to
my own; and, ere long, I purchased some fields
bordering upon my abbee, so that at last, it comprised
fifty acres; and my own household sometimes
contained no less than thirty persons. So
great was the fertility of my abbee, that I had yams,
cocoa-nuts, and plantains, in such abundance, that
even in the *hungry season*, or time of scarcity, after
making liberal presents to my neighbours, and feasting
my own family with daily plenty, the fruits
were left to drop off the trees. I mention this circumstance, 175
also, to show the honesty of the natives, 685
and their regard for strangers. Though they thought [829]

133
(131) The island of Pangai has a greatest height of 290 feet
(423) and a total area of 2,188 acres. All the island makes up one
(643) of the royal estates. There are two villages, Pangai and
Utulei. In 1931 their populations were given as 250 and 104
361 respectively.[4] The division of acreage between the two
(162) villages is roughly indicated on the island map (Fig. 1).A

(423) Because the principal economic activity of the villagers
128 is gardening and cultivation of root crops mainly, a note
(241) may be added on soil and climate. The following information[5]
refers specifically to 'Uta Vava'u but there is no reason
to think that it does not apply equally well to the island of
134 Pangai. The islands are of a coral-formation on a volcanic
base. The soil is rich and fertile. The climate is sub-
132 tropical with a humidity in mid-summer that is severe and
which has a year-round mean in Neiafu of 77 per cent. The
rainfall is fairly heavy with a wet season from December to
April and an occasional short but injurious drought between
October and December. (Rainfall range in Neiafu, 68 to
103 inches, mean of 82 inches.) The soil of the island is
312 very porous and water may be obtained easily by sinking
a well. Today however, the villagers rely on concrete
cisterns to obtain water for drinking and domestic purposes.
The number and location of these cisterns in Pangai village
is shown on the map (Fig. 2).B The prevailing winds are
132 the south-east trade-winds. During the rainy season,
hurricanes are an ever-constant threat to the villagers. Only
731 occasionally do these hurricanes occur with disastrous effect.
Every year however, the possibility of hurricane means an
ever-recurrent anxiety. A hurricane does great damage to
the gardens and cultivations and generally means food-shortage
for many months thereafter. Even strong winds
of less than hurricane force may cause great damage if they

[TEXT CONTINUED ON PAGE 10]

(104) Tongan orthography. No confusion need arise: it should be obvious that the village of Pagai on the map is the same village referred to as Pangai in the text. It is hard to answer the very natural question as to why we use these two orthographies thus, instead of one only. Presumably we think the Polynesian system more correct than the Tongan system although we would feel guilty if we tampered with the standardized spelling of place-names on a map.

[4] According to our household census, the population of Pangai in December, 1938, was 268 (see p. 69).

(113) [5] From Wood, A. H., *History and Geography of Tonga*, Auckland, 1938, pp. 85-86.

A. [See category 116, p. 6--Analyst]

B. [See category 116, p. 9--Analyst]

423 There is a certain measure of inequality among the
427 villagers in regard to leased *api*. Thus thirty-six men are
each lessees of one *api* of the smaller size. Six men are each
428 lessees of one big *api*; three men each rent two *api*; one man rents three *api*. The number of *api* that a man may rent depends somewhat on the vagaries of inheritance. This may be shown by the case of Biukala who controls three *api* on Pangaimotu and one in Tongatapu. In August, 1939, Biukala rented the last free *api* on Pangaimotu. He also controls the *api* of his dead father which in turn passed to his mother who now lives in Nukualofa. Thirdly he controls the *api* of his mother's mother (her husband is also dead). A fourth *api* in Tongatapu Biukala has inherited from his deceased father who was a Tongatapu man. Biukala pays rent each year for all four *api*. When his mother or his grandmother dies, Biukala may decide either to control their *api* exclusively for his own advantage or else arrange for a
[425] close relative to use the land. He could also, if he wished,
[651] relinquish the land by defaulting on his taxes.

423 It is obvious from this that as long as a young man
wishes to remain in the village of Pangai, he cannot
427 necessarily look forward to controlling by lease an *api* on the island of Pangai. Thus, according to Biukala, the male children of a man who rents but one *api* have now no hope of renting *api* for themselves on Pangai island. When they reach adulthood, they will either have to make arrangements to share the produce from an *api* controlled by another or else seek land away from their home village. Biukala
[311] estimates that one *api*, properly cultivated, could produce
ample food for at least twenty cultivators and their house-
[241] holds, although with this type of relatively intensive cultivation the amount of copra obtained from the land would become negligible.

423 The location of the plantations traditionally associated with residents of Pangai village is given by the numbers in Figure 1.[A] Of the 81 plantations surrounding Pangai, 53 are controlled by present residents of the village (44 by Pangai men, 5 by Pangai women, 1 being associated with the village school and 1 with the Free Wesleyan Church), 30 by past residents of the village. Of this last number, 13 are now resident in Neiafu, 13 in other nearby villages of Vava'u,

[A] [See category 116, p. 6--Analyst]

423
[427)

and 2 in Tongatapu. Those in Tongatapu do not cultivate their plantations but retain control of them as long as rent is paid. They presumably continue to pay rent because they at some time hope to return to Pangai to live. The 26 other non-Pangai residents were either at one time resident in the village or have inherited plantations from relatives. They are generally cultivating their plantations or else are using them for the production of copra. [241)

423
133

The grouping of the numbers in Figure 1[A] generally follows the topography of the island. Where the numbers are close together, the land is flat, fertile and easily cultivated. Where the numbers are widely separated as at the left of the map, the land is rocky or broken or infertile. To the right of the map where there are no numbers on the island, the land is controlled by the village of Utulei.

423
643
651
431

Although Pangaimotu is Royal estate no tribute is now paid by the villagers to the Queen in the way of a first-fruits offering. When the Queen comes to Neiafu on a visit, or should she at any time pay a visit to the village, special gifts of fine mats, bark cloth, pigs and food, are made to her by the people of Pangai. On a visit to Vava'u the people would honour the Queen in this fashion. The people occupying the lands of a Royal estate, however, would expect to make gifts greater in quantity and value than the general populace.

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The modern pattern of the villager's control over a small acreage of land through annual payment of land tax may superficially appear to represent a great change in aboriginal patterns of land ownership. Closer study, however, suggests that changes have not been great. The aboriginal commoner was a tenant farmer, working land granted to him by a feudal chief, paying to this chief a " rent " in produce, liable in theory to be dispossessed of his " rented " land at the will of his chief. Today, the ultimate owner of all land in the Kingdom is the Tongan government which has made land grants to Royalty and nobles. Land taxes are paid to the government representative. The Crown passes on these rents to the noble concerned if they come from his estate and keeps them for government use if the land is Crown property. The villager therefore no more owns his land today than he did in aboriginal times. A

[A] [See category 116, p. 6--Analyst]

512 The routine as given is for days during the month of
January. It is not to be supposed however, that this routine
varies greatly for different times of the year. There are no
[132] marked seasonal changes in the Tongan climate except the
change from a dry to a wet season. This change does not
[241] affect the growth of plants to any degree. Hence the villager
is cultivating for most of the year, and when he is not
512 cultivating, he is planting. Annual festivities such as
Christmas and New Year celebrations, missionary-confer-
527 ences and the like mean a certain crescendo of economic
activity because feasting and resting and then more feasting
are approved Tongan methods of celebration. This kind of
holiday-making can only be prepared for by extensive and
increased pre-holiday working activity. Otherwise, as has
been stressed, the daily routine is, by and large, the yearly
routine.

512 So far we have been considering the daily routine of the
128 villager in terms of the classified statements of a table. In
order to give some indication of what this daily routine
means in the life of the villager, the following notes are
taken from field-notebooks. They serve to show the contrasts
between day by day work on the one hand and the activities
centred round special celebrations on the other.

512 This is the way life runs in the village today: Bovai is
holding a working-party to clear the weeds from his pine-
461 apple plantation. Many men are busy there today—his
476 friends from the Catholic church and his male relatives.
They finish work in the early afternoon and then come back
[574] to Bovai's house where he has ready for them a large oven-
baked feast. Bovai finds this a good way to get large
amounts of work done. The men enjoy this kind of work
for a change. It is much more sociable, friendly, and
satisfying than sweating away alone in the bush with only
the persistent mosquitoes for company.

512 Hausia is taking no part in this working party. He is
working with the men of his own household on his own
461 plantation. The men take time off during the day to make
592 for themselves an elaborate feast in the bush. One of the
boys comes back to the village bringing with him a few baked
[574] *taro*-corms and some pieces of baked *manioke*. This snack
[262] is for Hausia's wife and the girls of the household who are

461 the round of gardens until all the immediate work is finished.
464 Food for the day is provided by the partner on whose land
the work is being carried out. He generally prepares an oven
476 to feed his companions.

571 This method of working is common village practice. In
461 discussing it an informant threw certain human sidelights on
work-habits which show how this type of partnership may
464 sometimes function. This informant said he never worked
476 in partnership with anyone. He believes he gets more done
571 by himself—it is obvious that he is not a true Tongan in this
124 respect. The working partnership, he thinks, is merely a
[183] temptation to talk, rest, eat, and sleep rather than work.
Some men are cunning in this respect. When the partners
are working on A's field, A scorns all talk and insists on hard
work for all three men. When in B's garden however, A
thinks of the most wonderfully amusing stories to tell his
companions and so little work is done by the end of the day.
Informant mentioned the names of three men whom we had
already observed to be a working partnership. Of the three,
[157] only C was a hard worker. The other two were sophisticated
and cunning with the result that hard-working C was doing
in reality all the work for all three men. C apparently did
not realize the situation. The three men were the best of
friends and for many days on end were to be observed going
to their plantations in the morning, returning together in the
evening laughing and joking. It is obvious therefore that as
long as the utmost amount of work is not the end of activity,
the working-partnership can function to the satisfaction of
its members and get enough work done to make such
organization worth while.

461 The other type of men's working-party, the *tou tu'u*,
functions when it is a matter of breaking-in virgin bush-
476 land. The owner of the land gets together a group of from
464 ten to twenty men. He assigns to each man a small section
241 of the bush-land. Each man clears his own section and
571 generally plants it with yams. From the first harvest each
[431] man gives the owner of the land a present of from two to
five yams and keeps the remainder for himself. Taro, *kape*,
or sweet potato, may be planted instead of yams. After this
[425] first year of cultivation the owner resumes full control of his
cleared land and plants it exclusively for himself. Through

461 464 476 241 571

the activities of the working-group he has had his land cleared in return for giving up one year's harvest from the land.

[574]

The owner of the land may also call together working-parties of friends and relatives for a day's work on his land whenever he wants to carry out some large-scale operation, such as clearing, planting, or making copra. From five to twenty men may help him with cultivation, or any number up to thirty men and women may participate in a copra-cutting group. The leader prepares a large feast in the bush consisting of staple foods together with relishes of pork, fish, and chicken, as a token of thanks to the working group. Whenever a group works together, each for his own interests, the feast has no part, but working in the group serves to lighten the burden of work. Only when the working party has come together to work to the advantage of one of its members is food prepared and offered to the group as a return for services rendered.

HOUSE-BUILDING

342 574 283

The villager wishing to build and own a Tongan-style house must first prepare large quantities of food for his workers and also large quantities of sennit *(kafa)* with which to fasten the house together. The preparations for a large house may take at least one year to complete. During this year pigs would be obtained and fattened, the requisite timbers and poles brought in from the plantations, sennit would be made and extra amounts of food-staples would be planted.

342 283

Even for a smaller house at least six thousand feet of sennit is necessary. To prepare this, the prospective owner collects from his plantation about one hundred coconuts of the *niu kafa* variety (nuts with an especially long husk). He is assisted by several of his friends whom he feeds while working with him. The nuts are husked and the husks placed in a large, specially prepared oven. This oven is about eight feet long, eight feet wide, and three to four feet deep. The bottom is lined with stones and further stones are placed on top of the wood. After the wood has burnt down, the coconut husks are placed in the oven, the oven

463 three master-fishermen; three other fishing-experts; three experts in medicine. Excepting cases where one individual may be an expert in more than one activity, this gives a total of fifteen different experts, of whom two in medicine are women, the rest being men.[11]

In some of these activities men other than the experts often claim enough skill to carry them on at a lower than expert level of efficiency. Thus many Pangai men can put up
[342] with some degree of neatness a small Tongan-style house. If on the other hand, one wanted to build a large Tongan house,
(335) complete with ornamental lashings and finished to the last detail, then the services of the recognized village expert
[757] would be necessary. Again, many doctor themselves for small pains and aches. Should pain become acute or not
[759] readily yield to simple treatment, then one of the recognized experts will be called in.[12] Finally, a man may fish with
[226] success indifferent or otherwise, according to what skill, luck, or knowledge he possesses. Should it be desired however, to carry out a large communal fishing expedition, then it would be absolutely imperative to place the direction of such an expedition in the competent hands of one of the master-fishermen.

The varied skills of these experts and the compensations they receive for their services are mentioned elsewhere in the consideration of specific economic activities.

PLANTING AND CULTIVATION

241 Clearing of land to be used for gardens may be done at any time of the year. A suitable area is selected, due consideration being given to exposure to sun, shelter from prevailing winds, and relative nearness to the formed bush-tracks that lead back to the village. The trees and undergrowth are cut down and thrown to one side. When dry they may be burnt and the ashes scattered over the cleared

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[11] Gifford (*Tongan Society*, pp. 143-146) mentions the names and duties of still other artisans who are not apparently represented today among the men of Pangai village.

[656] [12] Native medical treatment is forbidden by law but is practised everywhere, even in villages that have easy access to Government medical service.

land. Tree stumps may be left in the ground or an attempt 241
made to burn them out. Depending upon the area to be [464)
cleared and the urgency involved, this work may be done
by the men of the household, by a working-partnership of [476)
several men, or else many men may be invited to participate,
each clearing a small section in return for the first yam-harvest from the section cleared. Again, depending upon 244
taste and other factors of choice, one or more of several
different kinds of tubers may be planted in quantity.

Taro is easy to grow. Cuttings are planted and re-planted each time tubers are harvested. The tuber takes
about a year to mature. The giant *taro (kape)* is best planted [221)
between the months of March to September. It takes about
eighteen months to mature. The gardens are occasionally
hoed to keep back the growth of weeds.

The sweet potato is also an easy tuber to grow. It is [221)
best planted in the months between March and October. It
is planted in big hills, perhaps five hundred hills at a single
planting. The tuber takes from four to five months to
mature. The garden is hoed once during this time.

Plantain shoots are planted from June to January. The 245
tree takes about one year to mature and at the end of this [221)
time about five shoots may be replanted from this one tree. A
man will have between forty and one hundred plantains
growing in his garden.

Breadfruit takes up to five years before it bears a good
crop. Coconuts take about four years to mature. The
coconut is generally self-seeding though plants may be
cultivated if the land is poor in coconut-production. Papaia, [262)
a staple article of diet, is self-seeding. No attempt is made
to cultivate this fruit. Pineapples may be planted at any 244
time of the year, requiring about a year before the fruit is 245
ready to harvest. Mango, oranges, limes, and lemons are
not cultivated but grow wild. Watermelons are planted 244
between June and March, but because of the ravages of the 221
fruit fly, cultivation is hazardous.

It is on the yam however, that the village cultivator 244
lavishes most care and attention. The yam is considered 262
one of the most delicate-tasting of Tongan tubers and the
best of Tongan foods. The first yams of the new season are

244 often reserved for a feast-occasion. Expressions of satis-
262 faction are heard on all sides as the guests neglect the
commoner tubers and concentrate on the yams. To our taste
the yam did not seem particularly delicate nor greatly
[123] different in flavour from other tubers. But it would have
been impolitic to inform our hosts of our real opinion in this
matter.

244 There are some twenty-one different named yams that
the villager may grow. At most he will plant no more than
half this number depending upon his judgment as to which
244 are hardiest and most worm-resistant. The first yam-
cuttings are planted in June, very early in the month or else
221 at the time of the full moon. A second planting takes place in
August and a third from September to December. July is
considered a bad planting month because worms are more
244 likely to attack the shoots at this time. About one hundred
yam-cuttings are planted in each large hill. After the
cuttings have developed strong shoots, the hill is opened, the
yams replanted, from four to five shoots in each separate
hill. These small hills are again reopened and one shoot is
finally planted in a separate hill. For each complete planting
therefore, there are three minor plantings. Sticks are used
as supports for the growing shoots. The yam-gardens are
weeded and kept clear. Each hill will finally produce four or
five yams. They are mature in from five to eight months'
time. The June planting for example, will be ready in
December if there has been adequate rain toward the end of
[433] this period. One acre of land will grow about one thousand
hills of yam. From four to six hundred hills is considered
an adequate planting for the average household.

241 To give some idea of the size of the Pangai garden, the following figures were obtained for a small household of four persons. This household had planted about five hundred *manioke* (manioc) plants, one hundred hills of yam, eight hundred *taro* plants, sixty giant *taro* plants, forty banana trees in full bearing, together with small amounts of corn, melons and *kava* trees. Most of this was planted in August, 1938, when the family returned from a long visit to Tongatapu. On January, 1939, it was planned to plant a further three hundred *taro*

plants. The above staples would be planted as required 241
in such a way as to keep the amounts and proportions fairly constant.

Such is the fertility of the Pangai soil that only a small 241
part of a man's *api* is used for garden-purposes. Thus 423
Biukala controls three *api* which total about fifty acres. He 311
allows a relative to garden two acres of one *api*. The remainder of this *api* is given over to bush and coconuts. The second *api* is not cultivated but is used for coconut-production. On the third *api* Biukala gardens about three acres for his own household needs, taking coconuts from the remainder. From these three *api* Biukala thus supports his own household and that of a relative as well as securing, under optimum conditions, about twenty-five tons of copra each year. Most villagers with their normally small *api* can easily produce enough food for their households (if they are reasonably industrious according to Tongan standards) and can also expect to obtain up to five tons of copra each year.

Such also is the fertility of the soil that there appear 241
to be few beliefs, if any, of a magical nature associated with 789
garden cultivation. The villager knows full well that most of what he plants will grow. Insect pests, high winds and hurricanes, excessive rain or excessive dryness will affect his harvest from time to time. But it is convenient today to look upon these natural events as God-sent against which
the skill and hopes of man avail nothing. Similarly the [242]
influence of government agricultural experts and of agri- [654]
cultural teachers in the government and mission-colleges tends to inculcate a scientific fatalism where religious fatalism leaves off. Neither agricultural art nor religious excuse, taken singly or together, leaves much ground for specifically magical belief or practice. Garden magic therefore, is conspicuously absent in the emotional and intellectual make-up of the average Pangai cultivator.

LIVESTOCK

Most households in the village own at least several 231
pigs. These are necessary not so much for ordinary food- 524
consumption but in order to fulfil feast obligations whenever 527
these fall due at times of birth, marriage, death, visits of

way abnormal. All days were days of hard work in the 574
gardens following the working-lull of Christmas and New 574
Year holidays. They were also days of sometimes heavy 461
rain. This also increased the agricultural tempo because a [134]
wet soil makes both planting and cultivation easier. On one [241]
day only of these sixteen was there no *kava*-making. For the
remaining fifteen days altogether forty-five *kava*-parties
were held: eight in the morning, sixteen in the afternoon
and twenty-one in the evening. The houses at which the 574
parties were held is shown in the following Table 12. 592

TABLE 12.—FREQUENCY OF KAVA PARTIES AT VARIOUS HOUSEHOLDS. 551

	PARTIES			
Household Head	Morning	Afternoon	Evening	Total
Koloamatangi	2	3	4	9
Tevita	2	—	1	3
Ofa	2	—	—	2
Puaka	1	2	2	5
Pili	1	3	—	4
Biukala	—	3	2	5
Halahingano	—	1	—	1
Talivakaola	—	1	—	1
Afu	—	2	1	3
Eneti	—	1	2	3
Heu	—	—	2	2
Hausia	—	—	5	5
Tapaka	—	—	2	2
Total	8	16	21	45

It will be noted from this table that certain houses are 574
more popular than others as meeting places. The relative 342
popularity of a house seems to depend upon its largeness, its 592
coolness, its relative freedom from mosquitoes, the likeli- 584
hood of finding interesting company there, the frequency
with which the household-head himself begins the party, the 571
presence among the household members of a young girl adept at *kava*-making, the general hospitality or tolerance of the household-head to late hours (some evening parties continue until an early hour of the next morning, even until daylight), and finally, the extent to which the youth of the village are using the *kava*-party as an opportunity to court the girl of a particular household. All the houses in which

648 been worn on great occasions by chiefs anointed
643 with that precious essence. It is now, I believe,
431 among the curiosities in the royal collection at
175 Windsor Castle. He then told me some native
177 traditions of Cook's visit. When the vessels
829 were seen approaching Hihifo in 1773 there was a heated discussion among the Tongans as to whence they came. The king mimicked the querulous intonation of the old Tongans very funnily. "Whence come they?" said one. "Seuke!" exclaimed the old chief, Eikinaba, a noted wit in his day, "why, from the land of riches—from Babalangi!" (or, as we might say, from Brobdignag), and the nickname Babalangi has stuck to Europeans ever since. *Ba-ki-langi* ("shooting up to heaven") is the derivation which Fatafehi favours, meaning that the ships' masts reached to the sky. When the Tongans boarded the *Resolution*, the same chief, Eikinaba, noticed a strange yam on the deck and picked it up. "I *give* you that," said Tute (Cook), and from that day this kind of yam was called the *Kivi*.
[241] Favoured perhaps by the cooler climate and the new soil, this yam has grown to colossal dimensions. Cook had probably brought it from Rarotonga, or from Tahiti.

563 Of the number of curious petitions to which I

foes, and it is said of priests that it is better that they themselves
should die than that one who has taken refuge with them should 776
perish. Niukapu in gratitude to his deliverer told Kautae to take his 778
pick of a piece of land, but the priest instead asked Niukapu for his 793
kava, which means that in *kava* ceremonies Kautae has the right to
demand that the cup intended for Niukapu should be brought to him. 776
This practice is not very uncommon. There is an old gentleman in the 778
island of Haano, in Haapai, who, although not a chief himself, has the 793
right to demand the *kava* of a considerable number of chiefs on the
ground of their descent from his family. 276

Taufa is both a sea and a land god. In the sea he is manifested 574
as the shark, and is called Taufa-tahi, i.e., Taufa of the Sea. On 776
land he bore the name Taufa-uta, i.e., Taufa of the Land, but had no
separate sacred animal. In fact, Taufa-tahi and Taufa-uta cannot be 825
considered as two distinct manifestations of the god. Taufa was the 778
god, his totem was the shark, and he had his shrines ashore in which
he spoke through his priest. The name most commonly applied to 793
him is Taufa-tahi. Taufa's shark seems to have been a mythical sea 787
monster. Near Mua, the chief village in eastern Tongatabu, is a
place in the sea, where it is asserted that on calm days white mounds,
like the mounds heaped up over the graves of the dead, can be seen
beneath the water. This spot is called Taufa's cemetery, and here the
god, in the form of an exceedingly white shark, might be sometimes
seen.

Taufa was a notable protector of gardens. To secure the services 776
of the god the husbandman had simply to plait a coconut-leaf in the 241
semblance of a shark, and hang it up in his plantation. This placed
the garden under a *tabu* that none would dare to violate. It is said 776
that after the introduction of Christianity a man had the hardihood to 241
thrust his hand in mockery into one of these *tabu* signs; but the
moribund deity was not to be insulted with impunity, and soon after- 784
wards the sacrilegious violator, whilst bathing in the sea, had both
his arms bitten off by a shark. It is interesting to notice that the 776
priestly succession has been maintained to the present day, and a 793
Kautae is still regularly appointed.

Talisi Tubou is the god of the Tui Kanokupolu, whose title is now
assumed by the constitutional ruler of Tonga. Even before the advent of 776
Christianity real power was gradually passing out of the hands of the 643
Tui Tonga into those of more active lords, notably the Tui Kanokupolu,
who was in any case a very high chief. Tubou, the royal title of the 554
Tui Kanokupolu appears in the name of the god. Kanokupolu is
itself a small village in the west of Tongatabu, but the Tui Kanokupolu 103
chieftainship has long been a much more important thing than king of 361
this little village would seem to imply, but the real moment of the
name Kanokupolu itself must doubtless be sought elsewhere. Kupolu

a reef at low tide, suddenly fell down with some sort of 775
seizure. She was removed to the hospital. She declared
that the ghost of her mother's brother had struck her violently
across the face.

Exorcism for the driving out of spirits from possessed 789
persons is still sometimes practised.

In the central province, Haapai, a man severed his 775
connection with the Free Church and became a Mormon. [795]
His friends and relatives who were Free Church members,
declared there would be no rest for his soul. In a few months
he died. His widow and a relative were haunted by his
ghost, which would rudely awaken them from sleep by
shaking them. The nuisance was abated only when they
resorted to his grave and broke up his skeleton. His visitations
were thought to be a divine punishment for his disloyalty
to the Free Church.

On the night following the excavation of some ancient
burials on Kao Island the natives who were encamped a
hundred yards from the tomb, said they heard wailing at
the tomb. It was the "blood" of the deceased ancients bemoaning
the removal of their bones.

Anciently the apparition of an illuminated native sail- 763
ing vessel—a ghost ship—forboded the death of a chief. To- [178]
day European type vessels and even steamers appear as
ghost-ships portending death.

In one of the more remote Haapai Islands is at least 784
one Christian minister who places effective tabus on grow- 241
ing crops to prevent the inroads of pigs and rats. The
writer has himself seen plantations guarded by both barbed
wire and tabu badges. The latter were observed in two 784
forms. One was a small package of pulverized herbs to [754]
cause illness in the trespasser. The other was a cocoanut
leaf bound on the trunk of a tree as the emblem of Taufa [789]
the shark god. This bore with it the prayer that the trespasser
might be bitten by a shark when next he bathed in
the sea.

Christianity with its Sabbath and various "shalt nots" 177
has found a ready ally in ancient heathen tabu. The tabu 784
idea has simply been transferred to another set of concepts.
For the same reason quarantines (tabus) against various 744
islands or groups of islands are readily enforced by the
medical authorities to-day. The game laws, too, are heeded 671

Tongan landed chiefs are land hungry. The old practice 423
was to claim as much as possible of the neighbouring lord's 178
territory upon his death. Careful surveys now being made 425
by the government are fixing permanently the boundaries [428]
of hereditary lands, so that expansion of one's holdings at
the expense of some minor heir who is unfamiliar with his [656]
inheritance will soon be no longer possible. It is of interest
to note that the chief who would be Tui Tonga, if that office
had not been abolished, has by legal procedure in recent
years secured the return of lands improperly claimed by
others.

Euro-American culture has had a hand in transforming 361
the Tongan population from a rural one to a village-dwelling 177
one. The transformation had its beginning at the end of 178
the eighteenth century when civil war forced the people to [166]
leave their farms and seek refuge in fortresses. Thus village
life seems to have begun. Then came the missionary and a
great wave of religious enthusiasm which served to
reinforce the new village ties rather than to dissipate them. The [245]
copra trade and the scant attention required for the coconut
trees doubtless, in a negative way, has helped to perpetuate
the village life. The result is that modern Tonga is a country
of villages. The farms surround the villages at varying 241
distances and the villager makes periodic excursions to his 311
eight-acres of farm land. All of this has not been beneficial 178
to agriculture. Much land once cultivated intensively has
become bush. There are signs, however, of revival. A prominent
chief is inducing his people to give up village life
and dwell on their farms. Recently introduced agricultural
fairs seem also to offer a much-needed stimulus. It seems
likely that the next few decades will see a return to the
intensive cultivation of heathen days. The series of food 241
plants has been much enlarged by introductions. 178

Tracts of farm land are sometimes given the names of 103
foreign lands with which the Tongan has become acquainted
in school. More frequently, however, tracts within the
villages are given such names. The Tongan seems to have a 484
considerable interest in geography and he likes to travel. [181]
His geographic poems amply attest this. This love of travel [823]
and of topography is still rife. The monthly steamers and
the sailing passenger boats carry many Tongans from one
part of the archipelago to another or to more distant Samoa
and Fiji. Modern vessels continue to cater to the Tongans' [178]

The chief barrier to this development seems to be a general satisfaction of the commoners with things as they are. They have always been content to leave things to the chiefs, and have no serious grievances to stimulate them to political energy. Democratic institutions are seldom real or stable if they drop from the clouds; they become rooted in a society only when its people have learnt to appreciate and operate them, as a result of struggles to remove hardships. In Tonga progress towards political democracy is retarded, not so much because the present government is rapacious of power, as because it is productive of popular good.

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Agriculture and Land Use[4]

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The Tongan is a peasant, cultivating his compact holding in his own way, subject only to the easy and sensible requirements of the land laws.

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[4] The following tables provide a statistical summary of the nature of Tongan agriculture: 245

DISTRIBUTION OF FOOD TREES (1939 Census). 311

Group	Coconuts	Bananas	Pineapples	Other Food Trees
	%	%	%	%
Tonga Tapu . .	39	46	43	39
Ha'apai . . .	26	22	20	7
Vavau	26	23	26	35
Niuas	10	9	13	19
Total for Tongans	3,059	638	314	875
Total for Kingdom	3,260	682	335	890

DISTRIBUTION OF PRINCIPAL CROPS (1939 Census). 244 241 311

Group	Yams	Kumalas	Tapioca	Other Plants
	%	%	%	%
Tonga Tapu . .	55	57	42	28
Ha'apai . . .	14	25	38	22
Vavau	27	5	13	40
Niuas	4	13	8	9
Total for Tongans	1,504	600	1,245	1,671
Total for Kingdom	1,610	647	1,309	1,842

DISTRIBUTION OF LIVESTOCK (1939 Census). 231 311

Group	Pigs	Poultry	Goats	Cattle	Horses
	%	%	%	%	%
Tonga Tapu . .	39	36	44	78 (a)	60
Ha'apai . . .	29	26	23	3	15
Vavau	17	24	30	17	20
Niuas	15	13	4	1	5
Total for Tongans	19,120	49,744	3,484	1,024	5,016
Total for Kingdom	19,754	50,378	3,572	2,634	5,179

(a) The actual number is 2,058 of which 1,549 are owned by Europeans.

241 Before the civil wars he used to live on his farm, but today it may be
[461] some distance from his home in the village. Four days' not too strenuous work a week is usually enough to provide for his family's needs. A few friends may join together to do work on each other's farms, but arrangements of this sort are quite irregular.

241 About half of a typical farm consists of an unkempt area devoted to
311 the permanent cultivation of coconuts, and the remainder of a number of small plots cleared from a general area of bush and weeds. Less than half of it will be in use at any time since spelling is practised to conserve
241 fertility. Yams, bananas, and corn are planted on the better land, as are the tapa trees, a species of mulberry from whose bark the women fashion a coarse cloth. Taros thrive on less fertile soil, while kumalas and tapioca do well on comparatively poor land. Bananas and tapa trees are left to grow for three years on the same spot, but the food plants are shifted every year. Intermingled with these major crops may be found pineapples, paw-paws, breadfruit, mangoes, kava, tobacco, cotton, chillies, ginger, candlenuts, citrus fruits and a few European vegetables. Somewhere on the holding it is usual to raise sugar cane for thatch, reeds for house walls, pandanus for mats and baskets, and various shrubs for scents and dyes.

A farmer in Tonga Tabu will have about 250 yams, 200 tapioca plants, 100 kumalas, 100 banana trees, and 50 pineapple plants. These figures are fairly typical for the whole Kingdom but some variations occur. In Ha'apai holdings are smaller and more carefully cultivated, with fewer yams and more tapioca; in Vavau there are fewer kumalas but more breadfruit and corn; in the Niuas breadfruit replaces yams as the major food crop.

231 Primarily an agriculturalist, the Tongan makes little use of animals. He keeps perhaps half-a-dozen fowls, three or four pigs, and occasionally
[492] a goat or cow for butchering rather than for milking. Usually he owns a horse but does not use it for any farm work except carting. Sheep
262 are not raised at all. To relieve the monotony of a largely vegetarian diet he resorts mainly to fish, which is plentiful everywhere.

For a moderate amount of work, then, the Tongan's allotment
434 provides him with food, housing materials, tapa cloth, mats and baskets.
241 Besides these necessities it affords him a few small luxuries such as kava,
434 tobacco, scents, dyes, and native substitutes for soap. When he requires cash to pay taxes or rent, to meet Church subscriptions, or to buy a few store goods, he has only to harvest some of his copra or bananas.

From the standpoint of his own needs, therefore, the Tongan is an 241
efficient enough farmer, but if European standards are considered his 434
farming leaves much to be desired.

One of the first things to impress the outsider is the enormous waste 311
of land, for, apart from a few clearings for the food plants, the farm is 241
largely given over to prolific weeds. Equally glaring are the primitive 241
methods of cultivation. Machetes, spades, push hoes, and an occasional [412]
fork are the only implements used, and no appreciation is shown of the use of animal manure or of any other fertiliser. Reflection will suggest, however, that these conditions may not be entirely due to agricultural backwardness. Intensive cultivation would exhaust the soil, and in the absence of local supplies fertilisers would cost more money than the Tongan could afford. Weeds may rob the soil of moisture, but they do not exhaust its fertility and have at least the merit of preventing soil erosion. Undoubtedly much more could be produced from the average farm, but probably only if fertilisers, cattle and implements were provided on a scale beyond the resources of most farmers.

To a certain extent the general faults of Tongan farming may be excused. It is less easy to justify the defects of its particular branches, apart from a recognition that they may arise not so much from a lack of ability or energy as from a lack of agricultural training and capital. Many of the crops and especially fruit are ravaged by serious diseases and pests, which the farmer does little to control beyond avoiding to
plant obviously damaged material. The copra is of relatively poor 245
quality, commanding inferior export prices because it is produced, 251
harvested, and dried in a very haphazard way. The Tongan usually gathers it only when he needs money for some specific purpose, and this casual attitude, together with the infestation of weeds about the trees, leads to a considerable wastage of nuts. There are few hot-air driers in use, the greater part of the crop being rather carelessly sun-dried.

Perhaps the worst of the Tongan farming is animal husbandry. Not 231
only is the stock inadequate and of poor quality, it is also badly cared for. Systematic efforts to provide feed are rare, the animals being left to forage for themselves. It is not surprising that they are scraggy creatures, too often suffering from serious diseases. Tuberculosis is par-
ticularly rife in both cows and pigs. There is little attempt either to [232]
control these diseases or to improve the stock by breeding.

tic cultivation and the adoption of proper curing methods could lead 654 to a more plentiful and superior supply of tobacco, and might even 647 give the country a new export. Export markets might also be found 185 for corn, hemp, ginger, chillies, candlenuts and kava.

One or two secondary industries might also be developed. If cotton proved a practical crop, a cottage weaving industry would be a distinct possibility. Silk might be developed in the same way, since mulberries flourish in Tonga. Sugar cane flourishes too, yet no attempt has been [257] made to extract sugar, which is imported from Fiji. A small industry [439] could provide all the sugar the country needs, and the buffalo mills employed in North Borneo might prove suitable for this purpose. The Tongans take great pride in personal cleanliness, but cannot afford [515] to buy much soap. There is always plenty of copra: a livestock industry would ensure ample tallow, and the country would both increase soap consumption and save foreign exchange by setting up a small soap factory.

Mr. Cottrell-Dormer made a rough estimate of the cost of his complete scheme over the ten years he considered necessary to establish it firmly. His figure was £100,000, or less than half the amount of the [652] Kingdom's foreign investments. So far the War and other difficulties have prevented much being done to realise its very attractive possibilities. There have been recent attempts to reform agricultural education. but apart from them the only important step has been the Agricultural Organisation Act of 1940.[1]

The Director's scheme shows that much can be done to improve 241 Tonga's farming, its export trade and its standard of living. The 185 Agricultural Organisation Act, even if it is still in the initial and tentative stage of administration,shows that the government is conscious of the need for such improvement, and is prepared to do something about it. The institutions already set up have made a good start and

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[1] This Act sought to encourage planting, to promote co-operative effort, and to control the [474] marketing of export products. Local Producers' Associations are to be set up, under the leadership of the town officers, with the general object of improving farming, [439] and for such specific purposes as the acquisition and operation of hot-air driers. At the same time four export boards have been established. The Banana Board has already achieved an [241] improvement in the quality of banana exports by making inspections more thorough, and by insisting upon the use of knives for harvesting. It has also encouraged the use of locally made cases. The Copra Board is now the sole purchaser of copra and has already secured improved [435] export quality by introducing differential prices according to grade, and by refusing to purchase green copra. These authorities are all subject to a Council of Agriculture which co-ordinates [647] their functions, and which gives them financial aid from an Agricultural and Industrial Development Fund, established by a government loan of £1,000. The Council also acts as an advisory [652] body to the Minister of Agriculture.

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241 can develop into important agencies for the country's economic
185 development.

241 Tonga differs most from other Pacific island groups in that European
423 planters play an insignificant role in its agriculture. It has been the
[189] studied and consistent policy of the government to prevent the develop-
ment of European plantations and the consequent growth of a native
[563] proletariat. No one can buy land in Tonga, and leases to Europeans
are severely restricted. Less than 1,700 have been granted, and nearly
all of them are for commercial or residential sites. Only 24 are for
agricultural purposes, and none for an area of more than two hundred
[563] acres. These small plantations rely for their labour upon the 350
Solomon Islanders and Fijians resident in the Kingdom.

TONGAN TRADE

438 Commerce, particularly monetary commerce, is unimportant in a
land of subsistence farmers. Tonga has a considerable trade in such
438 local products as livestock, fish, vegetables, fruit, baskets, mats
437 and tapa cloth, but it is largely unorganised and mostly on a basis
of barter. The Tongan needs money for few purposes other than
437 to pay his rent and poll tax, to subscribe to his church, and to purchase
436 a few imported articles. The comparative unimportance of monetary
[439] transactions is shown by exports per head amounting to only £2·9
[651] in 1938, imports per head to £2·4, and native taxes per head to £0·2.[*]

439 Imports, indeed, play a very small direct role in the Tongan standard
of living. Nearly a quarter of them consist either of producers' materials
—copra sacks, banana shooks, timber, cordage, and rope—or of goods
which are largely for European consumption—tobacco, beer, spirits,
[511] automobiles and benzine. The significance of the imports that enter

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439 [*] Statistical summary of Tonga's Foreign Trade (Tongan Gazette).

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Year	Copra Exports	Average Price of Copra	Bananas	Other Exports	Total Exports	Total Imports
	£A	£A per ton	£A	£A	£A	£A
1933	105,028	9·2	—	9,419	114,447	86,007
1934	59,941	5·9	—	18,901	77,842	48,526
1935	79,003	6·6	—	11,708	90,711	68,782
1936	105,078	8·8	—	11,461	116,539	92,296
1937	158,133	13·1	4,128	2,359	164,620	137,365
1938	90,398	7·3	3,507	4,558	98,463	82,795
1939	64,545	6·1	12,026	3,249	79,820	79,696
1940	43,896	6·0	12,905	5,474	62,275	76,360
1941	25,548	6·0	24,179	6,732	56,459	71,943
1942	89,771	11·0	26,043	4,574	120,388	144,110

down and oppressed by that above it. Thus, if a 565
man or family possessed flourishing lands, or a 423
stock of hogs or poultry, or any other kind of 425
wealth, these were never secure from the covetous [671]
eyes of a superior. At any moment, any portion
of his goods, or all, might be demanded by an
imperious chief, and appropriated to his own purposes.
This system acted as an effectual bar to [241]
general improvement in the cultivation of the soil,
or the acquirement of property, by the mass of the
people. Beside this general right of the chiefs to 565
despoil their inferiors, the king, or his immediate 466
representative, could assess labour upon the entire 643
community, when and how he pleased.

Servile homage was paid to superiors, particularly 565
to priests and chiefs of the highest rank. Neither 554
their persons could be touched, nor their houses
entered, without express permission. Among them
a considerable degree of courtesy prevailed, accompanied
by a refinement of language and demeanour,
which indicated conscious rank. The distinction,
indeed, between themselves and the lower classes, [198]
was marked by these things, more than by any
great superiority in houses, or dress, or food; and
that this distinction might be carried to its farthest
limit, the chiefs had a conventional or courtly dialect,
understood and used only among and to themselves.
Respect for the persons or property of the
common people was unknown, when in conflict
with the covetousness of a superior. If a common 565
man made use of any consecrated property belonging 554
to a chief, or if he came into the presence of a chief 784
with a wreath about his head, or with the head wet,
or should he touch the head of the chief, or reach to
take any object from above where he sat, or should

[Eua]

Of the two former, nothing need be said here, as they were small and unimportant; but a passing notice of Eua may complete our view of the Tonga group. 797

Several visits to this island, at different periods, enabled us to form a good opinion of its physical character and capabilities. Having been styled the "granary of Tonga," we expected to see it in a very high state of cultivation, but we found nothing peculiar in it in this respect. At present it has but a very small number of people upon it; and these, being cut off from foreign intercourse through the want of a harbour, have no inducement to cultivate the soil beyond the necessities arising for their own support. The beauties of the island are great, and its richness of soil for agricultural purposes unquestionable, but these lie undeveloped. In former days, when the population of the country was greater, large supplies of produce may have been carried to the adjoining main island of Tongatabu, especially in seasons of famine caused by drought or hurricanes. From the effects of the one the snug and lovely valleys and ravines of Eua would be sheltered; while its flowing rivulets and streams would counteract the evil consequences of the other, at times when Tongatabu itself might be lying in temporary desolation. Hence the dependence of the Tongans upon Eua, at such times, for food; and hence, probably, the reason why it was styled, magniloquently, their "granary." 241 [177] [504] [134] [311] 174 438 731 [133]

One of the pleasantest Missionary trips I ever had was to this island, in company with the Rev. George Daniel, in the year 1851. We each took our own boat and boat's crew. The wind being 797

zeal of the queen's followers. The strainers (bunches of wild hibis- 643
cus fibre) were provided by special groups whose prerogative it was, 644
and represented certain chiefly families. 276 574

During the ceremony three conventional speeches were delivered 644
by three chiefs belonging to the Tui Kanokubolu group, who each 537
before speaking slid forward without rising, with two little jerks, 565
returning in the same manner to his place when his speech was fin- [516]
ished. These speeches followed traditionary forms, and were exhortations to the Tui Kanokubolu and the people to do their duty to the Tui Tonga chiefs. The first referred to shell-fishing, the second to the bonito fishing, and the third to the fruits of the soil.

An interesting feature of these ceremonies was a man belonging 644
to a family which is connected with Fiji, who was decked out like a 643
Fijian warrior. He preceded the royal procession to the ground by 784
about a hundred yards or so, crouching and running and looking 576
about like an outpost spying out the enemy. When the queen was [276]
seated he violated all tabus and rules of ordinary decency by taking [264]
up his station near her, passing freely behind or before her, smoking whilst standing or lounging close beside her, and finally, when the pig's liver which is customarily offered to the chief on such occasions was put before the queen, he broke off a piece on the point of his spear and ate it in her presence.

The sanctity of the great chiefs is well illustrated in an interesting 643
native manuscript which was made available to me by the kindness of 784
the Hon. W. Tungi and Mr. E. W. Gifford. In these notes the 192
special words applied to the highest chiefs, the Tamaha and the Tui Tonga, are called the *tobutabu* insignia, the most sacred insignia. Since the institution of monarchy on the European pattern the Tui Tonga words are applied to the reigning sovereign.

FISHING

Industries have their own tabus. I have been told that formerly 784
a woman must not step over the green shoot of a sprouting yam, 824
though this is not now regarded, and young women of the present 241 562
generation whom I have questioned know nothing of it. It was also 784
tabu for anyone to step over a fishing net whilst it was being made. 226

"And what then?" 226

"When it does not come there is nothing to do but return to shore, 784
because that is the proof that someone has violated the tabu of the 825
closed house, or perhaps that one of us has some grudge or anger in [828]
his heart. So we must go and correct what is amiss, and then the
fishing may recommence."[1]

The shark indeed is a great searcher of the heart, and the man [776]
who attempts to approach the cavern where resides the great shark-[828]
god of the island of Eua will find himself unable to reach the spot
should his heart be not as it should be. Although particularly notable
in the case of the shark the same type of idea is found in fishing generally.
Persistent ill-luck gets a boat a bad reputation which reflects [828]
more on the ethical qualities of crew and owners, and of the boat
herself, than on their skill as fishermen. "The fishing is accursed;
let us go ashore."

Gardens were protected by tabus. Frequently a coconut-leaf representation 784
of the shark was put up on the trunk of a tree, which was 825
as effective as turning the shark-god Taufa loose in the garden. It is [241]
stated that Taufaahau, better known to Europeans as King George I— [643]
under whom, after many years of strife, Tonga became a homo- [797]
geneous kingdom with Christianity universally and firmly established [776]
throughout the group—experimented with some of these tabu signs
to assure himself of the impotency of the old gods, and also made the
more daring test of swimming out to the opening in the reef of the
island of Lifuka in Haapai and shouting defiance to the sharks.

SIN

A general idea of the sort of conduct that was ethically right is 673
obtained by attention to the words which indicate wrong-doing. This [682]
is too lengthy an inquiry to be entered on in any detail in this place, [684]
but to inquiries as to what conduct would be formerly included under
the word *hia*, which is commonly translated "sin" but is today too
much mixed up with the modern machinery of law-courts to afford a
clear idea of its ancient significance, it was answered murder and
connection with the wife of a man of superior rank to the offender.

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[1] Op. cit., pages 59 and 60.

as a sign that if they met a certain man wearing a ragged loin-cloth 787
they would know that they had to expect opposition. During the 797
time when Taufaahau (King George I) was hesitating between Christianity 643
and heathenism a shark came alongside the boat in which he 787
was one day sailing. He seized his spear and made his throw an 797
augury. If he missed, the shark was the god Taufa-tahi (Taufa of the Sea), but if his aim went true then it was just a shark. He missed, and thereupon threw into the sea two native Christians who
were with him. The ancient Tui Tonga, Kauulufonua, in the midst 787
of his victorious career, declared on the eve of battle that in the coming fight his followers should know whether his prowess were the effect of his own might or of the protection of a god. If he were wounded in front he owed his victories to the god, but, if behind, to himself. The event showed that he owed his successes to his own courage and skill.

Mariner relates that the spinning of a coconut and observing its position when again at rest was a common method of interrogating the unknown, particularly as to the fate of sick persons. An instance of this has already been mentioned.

WITCHCRAFT

Something has been said of magic when speaking of tabu, but a 789
few further notes may be added. A non-malevolent but extremely 755
disgusting example of sympathetic magic was related to me by a friend. On one occasion whilst he was at sea and exceedingly seasick an old native, unable any longer to endure the sight of his distress, begged to be allowed to drink his vomit as a sure way of checking his sufferings. In my friend's case the mere suggestion threatened to be effective by depriving him once and for all of all the organs by virtue of which a man can be sea-sick.

But given magic there naturally follows man's effort to gain magical 754
control over his fellows. The usual terms applied to the black art 755
in Tonga are *hangatamaki* and *fakalouakau.* An excellent note on 241
the former term is contained in Mr. Murley's manuscript. He points out that the word hangatamaki, which is very freely used in descriptions of illness, covers a large range of disorders, principally of the

boil and ulcer sort; that further there are different individuals who 754 specialize in the cure of different diseases. Should a man desire, for 755 example, to put a tabu on his plantation, he will go to a person who 241 has the reputation of being able to cure some sort of hangatamaki with the request that this medicine man (or woman) assist him with his art. The practitioner then makes up little bundles of medicine and hangs them about the premises it is desired to protect. Should anyone, even the owner, dare to break the tabu and touch anything on the property he will be afflicted with the special hangatamaki in which the medicine man consulted specializes, who again is alone able to cure these punitive visitations, which he will be quite ready to do—for a consideration. When it is desired to remove the tabu the owner and the medical practitioner together go and take down the packages. The practice of putting a plantation under the protection of a shark god has already been mentioned.

In 1917 a man died in Tonga as the result of the black art as 754 practised on him by a man of Fiji. In this case the witchcraft was 829 described by the term fakalouakau, that is "by a leaf," or "making a leaf." It seems that a year or two previously the unfortunate victim had been on a visit to Fiji, and had been put under the spell of fakalouakau by a native of that country. Report hath it that contemporaneously with the death of the Tongan the maleficent Fijian also met his own end. One method of practising fakalouakau is to get something which has been in close contact with the person on whom it is desired to operate, e.g., nail-parings, and wrap it up and bury it. As the buried object rots a sympathetic disease will appear [753] in the victim. One man in discussing these matters drew his examples entirely from Fiji. He said that in Fiji a man would take a piece of young leaf shoot and chew it, muttering the while the name of the person he wished to injure. It is dangerous for anyone to come in contact with such a fragment of leaf after it has been spat out; and the basket in which the Tongan medicine to cause the hangatamaki is kept is likewise a source of peril. This man added the further information regarding the black art amongst his neighbors of the Fiji group that there one may cause foot trouble in an enemy by stabbing his foot-prints. A Fijian after drinking a coconut should

This sample is too small, but for what it is worth in the absence 434
of a larger sample, the correlation coefficients between labour and pro- 592
duction and between land and production suggest that money income 423
varies more readily with the quantity of labour available than with the 433
amount of land; i.e. a man is more likely to obtain a greater income by working harder than by increasing his land holding.[27] Uneven as it is, therefore, the distribution of land exerts only a minimal influence upon the amount of money obtained. This may partly explain why an uneven distribution of land tends to be left undisturbed; but this latter tendency may be tolerable only at the present level of economic development and may tend to disappear at a higher level.

6—LAND USE AND LABOUR

The legal provision relating to the planting of coconuts at intervals 311
of 30 feet is, by and large, followed consistently on the majority of the 245
api I have seen. Amongst the coconut trees there would be food and 244
cash crops of several types, bananas, taro, yams, sweet potatoes, *manioke*, and even pineapples and water melons. In general, these are not planted in sharply defined plots but are interspersed one amongst the others, so that in an intensively cultivated *api*, members of all species would be found on each square chain of ground. This is more or less the general pattern, although there may be varying degrees of emphasis upon particular crops in particular parts of the *api*. Varying the pattern of emphasis would appear to me to play a similar role to straight out rotation.

The coconut trees belong to the planter but are heritable with 423
the land on his death or secession; and as their normal productive life [428]
is 50 or 60 years, they may change hands several times during their
lifetime.[28] But the other crops, requiring from three to eighteen months to mature, are the property of the planter, whether he be the legal holder of the land or not.

The distinction between permanent and annual crops makes it 423
easier to understand all the sharing of *api* referred to in the previous 311
section. For while the current holder of an *api* owns the coconut trees 241
and other permanent resources, he need not have the whole *api* under 476
the less permanent crops at any one time.[29] This gives him room to permit a friend or relative to plant for himself a crop of taro or yams

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[27] My calculations produced correlation coefficients of r = .32 and r = .54 for land and labour respectively.

[28] The evidence of the 107 *api* which I studied shows that several of them had changed hands twice or thrice in the previous five or six years.

[29] The Beagleholes quote a man who estimated that up to twenty cultivators and their families can live off one *api*, Beaglehole 1941:18, but it is not clear whether this refers to an ordinary *api* of 8¼ acres or to one of the larger ones which may be up to 20 acres in area, Beaglehole 1941:17. In this connection it may be interesting to note that in a village of about twenty households which I studied in Fiji, the total area covered by food crops in various stages of development was found by detailed measurement to be 8.1 acres for all households.

423 on a section of it, always on the understanding that the holder has the
311 right to demand it back after the crop is taken out. No rights other
241 than those of cultivation accrue to the borrower. Although such an
476 arrangement involves definitely no rent in money or in kind, it is advantageous to the allotment holder in that the section so lent is
[427] thereby kept free from weeds and heavy undergrowth.[30] The fact that no rent is involved actually strengthens the hand of the holder when
c he demands his land back. As far as rights to land are concerned, the same principles apply when a man uses part of the *api* legally held by his brother, or when a number of brothers use the *api* of their father.

592 Individual land holders can call upon several types of *work groups*
241 to assist them in working their land. The most important work group
[476] is the household which, under the leadership of the head of household, performs most of the day-to-day tasks of cultivation. Its importance lies in its relative permanence. For while the other work groups considered below come into operation only in connection with the heaviest tasks such as clearing and occasionally planting, and therefore tend to be relatively impermanent, the household deals with the constantly recurring need for weeding and other minor tasks, and is the only unit which can engage in long term planning on the basis of its own self-interest. It is the basic unit of production and consumption; and its members are bound together by common interests which transcend the
[476] economic sphere. Its significance needs no further elaboration. But beyond this unit, three other types of work group are found: the *tou ngaue*, the *kautaha* and the *tou lalaga*.

476 The *tou ngaue* is a working party which may comprise anything
241 from two or three men to about eight or nine, the members of which
[462] work co-operatively for each of the members in turn. The members are not fed by the person for whom they are working as in the case of Pangai reported by the Beagleholes,[31] but each feeds himself and then goes back to work. In this way they achieve the ends which demand co-operative work, but avoid the encumbrance of preparing food for others. At the time of my investigation, there were three *tou ngaue* in the village under investigation. Their memberships were 3, 5, and 8 men respectively.

476 Kinship does not appear to play an important part in the formation
241 of these groups. While there are occasional *tou ngaue* which have a
602 large proportion of members who are kin, the principle of kinship does not specifically enter into the definition of the *tou ngaue* as such. When asked whom he would choose to be members of his *tou ngaue*, a man once replied, "My friends". But when pressed further to define what he meant by "friends", he said, "Those who work hard on my plantation". "Would you choose your brothers or close relatives particularly?" "No". The relationship seems therefore to be a purely economic one.

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[30] The sort of arrangement involved in the work group known as the *tou tu'u* described by the Beagleholes is particularly interesting in this regard, Beaglehole 1941:33-34.

[31] Beaglehole 1941:32.

The *kautaha* is described by one informant as a "big society". It is 476
formed for a specific purpose and joined by men interested in achieving 241
this purpose. One example would make the matter clear. In one village 245
I visited there was a *kautaha* with a membership of about 40 men, [462]
comprising the majority of the adult males in the village, which was
formed for the purpose of extending banana plantations. The overall target was that each member should have 1,000 banana shoots planted strictly for himself by a certain day in December; and once this overall aim was agreed upon, they split themselves up into four *tou ngaue* of 9 or 10 members each for the purpose of actually doing the work on the land. While the *kautaha* as a whole was interested in the progress of its members towards the target, the actual organisation of work was left to the various *tou ngaue*: these were the media through which the members ensured that their own bananas were planted. A lot of hard work was carried out in clearing the bush and planting the shoots, and on the appointed day the leading members of the *kautaha* did a complete tour of the plantations of each member to ensure formally for the *kautaha* that the bananas had actually been planted. It was an almost ceremonial affair, ending with the consumption of an elaborate feast.

The *tou lalaga* is the women's work group formed for the making 476
of *tapa* cloth. The task of joining together pieces of beaten bark into 287
large pieces of *tapa* cloth is a laborious one requiring the labour of [462]
many hands, and for this purpose women would call upon their friends
to come and help. The friends in their turn would call on their own friends, and in the end 50 or more women may be involved. In this case the women are fed by the owner of the *tapa* cloth.

7—KINSHIP AND LAND USE

There are two important ways in which fully autonomous house- 241
holds may be connected with one another through use of the land which 592
they work. In the first place, when land is short and a number of 476
families have to go without, they can usually make do by sharing the use of the *api* of others or by using the *api* of those who are away from
the village. In the second place, a group of brothers or of a father 241
and his sons, although living in separate households and owning 592
separate *api* at law, may combine together their entire holdings and 593
work them as a single unit. In the village under study there were two 476
clear-cut cases of this sort. In each case the *api* concerned were contiguous, and clearing, at which the men concerned worked together, ranged from one *api* into the next. Copra was certainly produced jointly [245]
and the proceeds controlled by the senior member; but I am uncertain
whether food gardens were individually owned.

In both cases, kinship is an important factor in the alignment of 592
households. Of the 19 households that share the use of the *api* of others 241
in the village under study, 10 share with related households and 9 476
share with unrelated ones. Of the 9 that share with unrelated house- 602
holds, 5 have no relatives in the village anyway, leaving only 4 which

592 share with unrelated households in preference to sharing with related
241 ones.[32]

476 One of my informants deliberately played down the role of kinship
602 in land matters. He argued that landless people share the use of the
592 land of their friends, people with whom they are on specially good
241 terms; people who are closely associated in other spheres of activity,
476 such as the religious or the economic; and above all one tries to obtain
572 the use of lands which are specially fertile or which lie near to the
602 village. While "friends" here may include relatives, this is not
necessary. Such an explanation would, of course, cover the cases which,
from other points of view, appear to be inexplicable random variations;
and at the same time show how "open" relations through the land can be,
giving the land tenure system much of its flexibility.

474 Thus it has appeared that kinship plays no great part in the
602 organisation of labour, but a perceptibly greater part in the handling
311 of the land resources available to the community. But kinship not only
[476] affects the people's relation to their land in the way already indicated;
it also does so through inheritance. The rules of inheritance have
already been given, but it may be added here that it is through
inheritance that particular individuals come to control a duplication
of *api*;[33] that females can hold land; and that the title to *tofia* holdings
is passed on from one generation to the next in the chiefly line thus
perpetuating and strengthening the most important factor for political
control in the kingdom.

592 In the village under investigation, however, the range of kin recog-
602 nized for these purposes does not seem to extend very far. While
there are clusters of households between whom there are specially
strong ties of kinship, the great majority of them recognize such
relations with only one or two other households. The count taken, from
one household to the next, reveals that in most cases these relations
are based on affinal ties. The range of connections over the whole village
is as follows:

TABLE 3

DISTRIBUTION OF KIN AMONG HOUSEHOLDS

No. of Other Households containing Kin	No. of Households
0	18
1	21
2	28
3	16
4	11
5	8
6	4
	106

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[32] The reasons for such preference are obscure, but the explanations given to me were largely in terms of economic self-interest. See, for instance, the section on work groups, p. 108.

[33] See, for instance, Beaglehole 1941:18.

39: Gerstle & Raitt C,Q-4,5 (1952-1972)
1974 OU9 Tonga OU9

181 as tourism, foreign economic interest, prices of
178 consumer goods, pressures to work and study
457 abroad, and the rural-urban drift which is creating
435 grave unemployment and population problems on
Tongatapu, intensifies the dilemma of *how to*
369 *improve the quality of life while preventing cultural*
464 *and social deterioration.*

Although Tonga's economy is based primarily on
433 agriculture (main exports: copra, bananas,
241 desiccated coconuts), Tonga is slowly moving away
from being a society of substantially subsistence
433 farming. Tourism, which is rapidly becoming a
major consumer industry, is being encouraged by
457 the government as a source of employment and

[p. 54-B]

39: Gerstle & Raitt C,Q-4,5 (1952-1972) 1974 OU9 Tonga OU9

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Farming is the basis of Tonga's economy. Although many farmers still grow crops for their own consumption (i.e. staples like taro, yams, plantains), Tonga is gradually making the transition to cash farming (with coconuts, bananas, pineapples, tomatoes, vanilla beans, etc. being cash exports). The "Coconut Replanting Scheme" (photo above) near Fua'amotu is a government project for rehabilitation and expansion of the coconut crop.

Ko e kelekele 'oku tefito ki ai e ma'u'anga mo'ui 'a e kakai Tonga. Neongo 'oku kei to pe 'a e ngoue ke fai mei ai ha kai, 'oku faka'au ke lahi ange eni 'a hono to e ngoue fakapa'anga, hange ko e temata, vanila mo e faina. Ko e ta eni 'o e To Niu Fo'ou ofi ki he mala'e vakapuna 'i Fua'amotu.

wettest months throughout Tonga, but the seasonal 132
pattern differs markedly from year to year. Applying Mohr's definition of a dry month (Mohr, 1944)[1] Nuku'alofa and Pangai have much the same incidence of dry conditions (with 23 and 25 per cent of all months in their respective rainfall records classed as dry), and are appreciably less humid than Neiafu with only 16 per cent of months classed as dry.

With the exception of some of the western Ha'apai 134
islands, where the soils are underlain by tuff, all the soils in the three main groups are underlain by coral limestone, but the major parent material appears to be the volcanic ash which has covered all the raised limestone islands. The main soil type is a fertile, friable soil termed *kelefatu* by Tongans and varying in texture from a loamy sand to a clay. The other significant type, *tou'one*, is a sandy and less fertile soil found at low elevations near the sea, and is proportionately most important in Ha'apai. About 85 per cent of the total area of the raised limestone islands is suitable for cultivation.

Most of the agricultural land has been surveyed 241/
into allotments which are generally eight and a 423
quarter acres in size, except in Ha'apai and parts of Tongatapu and Vava'u where because of the population density, holdings have been reduced to between three and six acres. The allotments are held by individuals as lifetime inheritable leaseholds, but about 60 per cent of those males entitled to land do not in fact have an allotment and either borrow the use of land or depend entirely on other types of employment (Maude, 1970).

Population distribution is uneven. In Ha'apai, 161
southeastern Vava'u and western Tongatapu crude 162
population densities are comparatively high and range from about 450 to 700 persons per square mile, whereas in western and northeastern Vava'u and central and eastern Tongatapu densities are around 200 to 300 persons per square mile.[2] These [134]
contrasts in population density date back to at least the nineteenth century and probably earlier and

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[1] A dry month is one in which rainfall is less than 60 mm (2.36").

[2] Population densities are based on the 1966 Census (Kingdom of Tonga, 1968).

cannot be explained by variations in land quality. 161 Climatic and soil conditions in Ha'apai do not seem 162 dissimilar to those in Tongatapu, although in Ha'apai 134 the less valuable *tou'one* soil type occupies a greater proportion of the total land area than in Tongatapu; neither is there any evidence to suggest that land in western Tongatapu is inherently more productive than land in eastern Tongatapu. The 361 main explanation appears to lie in the relationship between settlement and marine resources. Seafoods [262] have always been valued items in the Tongan diet, although fishing and reef-collecting have declined [226] in recent years as canned meat and fish have become more easily obtainable. Village settlement therefore tended to concentrate where there was a good balance between the resources of the land and the sea. Where shores and reefs were productive but the 361 land area limited, as in the small islands of Ha'apai 161 and the narrow western point of Tongatapu, population 162 densities were higher than where productive shores were backed by more extensive land areas, as in central and eastern Tongatapu, or where unproductive shores limited village settlement, as along part of the south coast of Tongatapu. The population growth of the present century has quickly brought problems of land shortage to the former areas.

THE AGRICULTURAL SYSTEM

241 ● The basis of present Tongan agriculture is a bush fallowing system for the cultivation of tubers, the term *bush fallowing* being used to denote a form of shifting cultivation in which the fallow period is short (Morgan, 1959; Watters, 1960.)

The agricultural cycle begins with the selection of a plot for clearing, burning and planting, the selection being based on the requirements of the crop to be grown and the land available to the gardener. Tongans judge land by the type of soil, by the growth of vegetation and by their previous experience in cropping, but because of land shortage and the system of land tenure the area available to choose from is limited, despite the common practice of borrowing the use of land. Where the soil is 244 considered to be sufficiently fertile a yam patch (*ma'ala*) begins the cropping sequence, and most

[p.58-B]

gardeners try to plant one and sometimes two *ma'ala* 244
a year. Giant taro (*Alocasia macrorrhiza*) and/or
plantains and bananas are usually planted with [245]
the yam (*Dioscorea alata*), in rows 12 to 18 feet
apart. In the more densely populated areas taro
(*Colocasia esculenta*) is often inter-planted in the
same plot, but in central and eastern Tongatapu
this practice appears less common. When the yam
is harvested it is replaced with taro, sweet potato
or cassava. Taro is harvested as needed and as the
tubers are dug the stems may be replanted for a second
crop. Cassava may also be replanted one or
more times, up to five successive crops being taken
before the land is rested. The cropping sequence [245]
may sometimes end with plantains and bananas
rather than tubers, with the former crops being
inter-planted with the last crops of taro or cassava
and being left on the land when these are harvested.
Apart from yams, sweet potatoes may also begin a
cycle of cropping. They are usually the first crop on
sandy *tou'one* soils and are frequently grown on
newly cleared land in the grassy areas of central
Tongatapu. The next crop is then generally cassava, [245]
and bananas and plantains may be grown with the
tubers.

Although definite but flexible patterns of crop 241
succession and crop association (or inter-cropping)
can be distinguished, the value of these is uncertain.
Inter-cropping as practised in Tonga probably has
some advantages. The growing of a variety of crops
together provides a better cover for the soil, and
consequently protection from sun and rain; the
labour needs for weeding are also reduced. Different
crops make different demands on the soil, and inter-cropping
may therefore be a more efficient way of
utilizing a garden area. On the other hand the patterns [242]
of crop succession appear to be related more [244]
to the requirements of the various crops than to [245]
any attempt to develop rotations which conserve
soil fertility, and the basic crops which are rotated
are all tubers, with the exception of bananas and
plaintains. Yams are planted first because they 244
require a loose soil well supplied with plant nutrients,
conditions best found in land newly cleared
from bush, while sweet potatoes, taro and cassava
are less demanding and can be planted on land

already cropped. Sweet potatoes do better on lighter 244
or less fertile soils, which do not promote excessive
leaf growth at the expense of tubers, while taro is
generally grown on heavier soils. Cassava can be
grown practically anywhere, and because it yields
well even on poor soils is frequently last in the
cropping sequence.

After a cropping period of from two to about
five years the plot is bush fallowed. The cessation [245]
of gardening, however, is often gradual as taro,
cassava, bananas or plantains may remain on the
land and continue to be harvested for one or more
years after cultivation of the plot has ceased, a practice which is not uncommon amongst shifting cultivators (Webster & Wilson, 1966). Taro may also
be planted and left in the ground as a reserve against
future needs.

Some cash crops are grown as an integral part of 241
the bush fallow system. Bananas, for example, are
frequently planted as part of the cropping sequence 245
and yield for only a few years before the land returns
to bush. At present, however, with the very marked 245
growth in banana exports over the last few years 439
bananas increasingly are being grown in separate 242
plantations, though often with some inter-cropping
of food plants, and chemical fertilizers are being
much more extensively used both to improve yields
and to extend the life of the plantation. Watermelons 244
are another, but minor, cash crop grown by the
bush fallow system, as the first and sometimes the
only crop planted on newly cleared land.

Coconuts, on the other hand, as a long-term tree 245
crop, are not cultivated as part of the bush fallow
system, but are unevenly scattered over part or all
of each allotment. Most farmers prefer to keep part 245
of their land free of coconuts, because they say that 241
the shade cast by the palms lowers the yields of the
crops grown under them, and in the past a common
practice was to plant half of an eight and a quarter
acre allotment in coconuts and leave the remainder
fairly clear. Particularly in Ha'apai, however, those
with small allotments (around three to five acres)
have found it necessary to plant all their land to
ensure a reasonable cash income. Consequently
the Tongan farmer now rotates his gardens around

43: Maude K-4,5 (1962) 1970
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an allotment partly-to-fully planted in coconuts, and two types of land use (which in neighbouring parts of the Pacific are largely kept separate) are increasingly being combined on the same site. 245 241

While inter-cropping amongst coconuts has become common in Southeast Asia and has many economic and technical advantages under systems of more continuous cropping (F.A.O., 1966), under present Tongan conditions the result is not satisfactory.[1] Coconut yields may be temporarily improved by the occasional clearing of the bush growth for new gardens, but the burning of the cut vegetation scars the base of the palms and once a garden is finished the fallow vegetation is allowed to grow up around the coconuts to form a tangled mass. This fallow growth not only competes with the palms for plant nutrients and soil moisture but also makes it difficult for the grower to collect the nuts. Competition also comes from the crops planted, for no attempt is made to keep a clear space around each palm and, except in the case of bananas and watermelons, no fertilizer is used. Consequently only where a cash crop that will pay the cost of fertilizing is grown is inter-cropping probably of benefit to coconut yields, and where coconuts and food crops are grown together the yields of both are reduced by competition, shading and damage to the root systems of the coconuts. As yet, there is therefore no satisfactory integration between the bush fallow food cropping system and the coconut plantation. [171]

THE EFFECT OF POPULATION GROWTH ON AGRICULTURE 121

The effect of population growth on the agricultural system outlined above can be studied by examining the system in the more densely populated areas of the Kingdom (the areas in which the system is now under the greatest pressure from population growth), and by comparing agrarian conditions in these areas with those in the less densely populated districts. This aspect of the study is here confined to Tongatapu and the Ha'apai Group (excluding Tofua and Kao), which are made up of islands basically similar in climate, topography and soil.

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[1] This account describes the situation before the current Coconut Replanting Scheme began to have a significant effect on Tongan agriculture.

[p. 60-A]

6

The areas of high population density are the western 161
end of Tongatapu and all but one of the islands of 162
Ha'apai, and population densities in these areas
have roughly doubled since 1931 (Table 1). The 128
analysis is based partly on material collected by
observation and questioning throughout Tongatapu
and Ha'apai, and partly on more detailed data for
three villages with moderate to high population
densities (Table 2 and Fig. 1).

In areas of high population density fallow periods 241
are shorter and cropping periods tend to be longer 182
than elsewhere. In Ha'apai the cropping period is
usually from three to five years, compared with the
two to three years more common elsewhere. This 241
is indicated by item 6 of Table 2, for the ratio of
total per capita garden area to the per capita area 128
cleared in 12 months gives an estimate of the life 182
of gardens. The figure for Holopeka, however,
appears rather high, as in this village few gardens
were seen which had been cropped for more than
four years, and it seems likely that for some reason
a smaller area than was usual had been cleared for
new gardens that year.

The length of the fallow period, on the other 241
hand, is only one to three years in Ha'apai as com- 182
pared with three to five years elsewhere. This dif-
ference is also illustrated in Table 2, which shows
the median fallow period (item 8), although the
figures are based on too few gardens to be conclu-
sive. Many farmers interviewed in Ha'apai claimed
to be using shorter fallows than when they began

TABLE 1. POPULATION DENSITIES, 1931 AND 1966 161
(PER SQUARE MILE) 162

DISTRICT	1931	1966
Ha'apai*	316	517
Western Tongatapu**	248	540
Remainder of Tongatapu***	85	335

* Excluding Tofua, Kao and the unsettled islands.

** Including the villages from Ha'atafu to Fo'ui.

*** Excluding Nuku'alofa and the surrounding settlements of Hofoa, Puke, Sia'atoutai, Fatai, Haveluloto and Tofoa, and their lands. This has been done to remove the population of the urban centre of Nuku'alofa, the national capital, from the calculation of population density. [128]

[p. 60-B]

TABLE 2. AGRICULTURAL DATA FOR THREE VILLAGES, 1962

VILLAGE	HA'AVAKATOLO	HA'AKAME	HOLOPEKA
1. Location	Western Tongatapu	Central Tongatapu	Lifuka, Ha'apai
2. Population*	245 (1962)	299 (1962)	147 (1966)
3. Population density (per square mile)	460	390	588
4. Total per capita garden area (acres)	0.37	0.30	0.30
5. Per capita garden area cleared in last 12 months (acres)	0.18	0.17	0.05
6. Ratio of items 4 to 5	2.6	1.8	6.0
7. Number of households whose gardens were surveyed**	16	13	12
8. Median fallow period (years)	4.5	4.0	3.0
9. Number of gardens on which item 8 is based	12	9	8

* The 1962 figures were collected by the writer. The 1966 figure is from the census.

** These represent sampling fractions of one-third, three-tenths and one-half, respectively.

[p. 61-A]

161
162
241/
182

farming, instancing reductions in the fallow of from 241
four to five years down to two to three years and 182
from three to four years down to one to two years.
Furthermore, in Ha'apai the fallowed land is more 241
likely to include scattered crops of cassava or taro,
for some farmers have a type of combined cropping 244
and fallow period in which the grasses and other 182
herbaceous plants of the fallow regrowth are left
unweeded around the crop, except when part of
the crop is harvested and replanted. Farmers claim
that both the fallow growth and the cassava help
to restore the fertility of the soil, and that when the
plot is finally cleared and harvested, after perhaps
two years, it can be planted immediately in yams.
This is a more intensive development of the com-
mon practice of leaving some crops on the land after 241
cultivation of the plot has ceased, for the crops are 182
often replanted while the plot is under bush fallow
growth and cropping continues during the whole
of the fallow period.

In Ha'apai and western Tongatapu land shortage 241
has led to most allotments being completely planted 245
in coconuts, although often with a fairly open spac-
ing of the palms. In the village of Holopeka, for 182
example, only one garden was found in which an
area, no more than an acre, had been left clear of
coconuts.

[p. 61-B]

43: Maude K-4,5 (1962) 1970
OU9 Tonga OU9

There are also significant differences in the food crop pattern between areas of high and low population density. In areas of high population density cassava becomes the staple food crop and yams are less frequently grown, despite the fact that cassava, which was only introduced into Tonga in the nineteenth century, has a low status as a food and yam is the prestige tuber. With the widespread planting of coconuts and the shorter fallows which have resulted from the increasing pressure on the land farmers complain that there is now less land suitable for yam growing, and many are unable to afford the long fallows considered necessary to produce the right soil conditions for the tuber. Cassava, on the other hand, is easy to cultivate, is more resistant to drought than the other staples available, gives good yields even on heavily cropped soils, and does not require a lengthy fallow. In Ha'apai it is not unusual to find plots which have been cropped with cassava for four or five years in succession. Dryland varieties of taro have also increased in popularity because they can be replanted several times, and like cassava were introduced into Tonga only in the nineteenth century. 241 182 241 182 244 [245]

The reaction to population growth has therefore involved a reduction in the fallow period, a lengthen- 241 182 245

[p. 61-C]

ing of the cropping period,[1] a change in the food 241
crop pattern, and a complete areal merging of the 182
bush fallow food cropping system and coconut [245]
growing. In some districts the agricultural system
is now quite intensive by shifting cultivation stan- [161]
dards, with a cropping period/fallow period ratio [162]
of about 1:1, and supports population densities of 500 to 600 persons per square mile (cf. Nye & Greenland, 1960, p. 128). However, despite the probable doubling in the intensity of cropping over the last three or four decades there has been no change in the most important element in the system, the technique of maintaining soil fertility. The vast majority of Tongan farmers still depend on a bush fallow, and while fertilizers are increasingly being used for some cash crops this is mostly in central and eastern Tongatapu, where the major commercial banana growers are concentrated, rather than in more densely populated and more intensively
cultivated western Tongatapu or Ha'apai. Fertili- [242]
zers are not used for subsistence crops, neither have other techniques such as planted fallows, composting, manuring or crop rotations been adopted. The agricultural system remains a fairly simple one, and the unsatisfactory features described in the previous section remain.

Two broad explanations for this lack of change in agricultural techniques can be offered. In the first place, it is possible that under Tongan conditions such improvements are not yet necessary.
The soils, being derived from recent volcanic ma- 241
terials and not subject to intensive leaching in Ha'- 182
apai and Tongatapu, are of high inherent fertility. 134
While the increased intensity of cropping appears to have resulted in a moderate decline in fertility status, it is possible that yields have been maintained by the adoption of new crops, particularly cassava. Furthermore, Nye and Greenland (1960, pp. 123, 129) point out that under a bush fallowing system it is possible to crop at varying levels of intensity and fertility without catastrophic consequences to the soil, and that up to a limit decreases in yields resulting from an increase in the intensity of cropp-

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[1] According to Nye and Greenland (1960, p. 123) the general response of shifting cultivators to population increase is to change only the fallow period.

ing may be more than offset by increases in overall 241
production because of the longer period of cropping.
Shifting cultivation systems, in other words, are 134
fairly flexible, and may be able to undergo a good 182
deal of intensification without change in the technique
of maintaining soil fertility.

A brief examination of possible areas of stress 241
within the agricultural system, following the approach
of Farmer, Lea and Street (Farmer, 1954; 134
Lea, 1964; Street, 1969), suggests that the above 182
argument might possibly apply to Tonga. Increased 121
intensity of cropping will produce changes in the
fallow vegetation, in soil fertility and erosion, and
in crop yields, and the severity of these changes
gives an indication of the extent to which changes
in the bush fallow system are necessary.

Firstly, increased intensity of land use has resulted 241
in some changes in the fallow vegetation. In the 182
densely settled areas the secondary growth consists
of grasses and other herbaceous plants, and shrubs 241
such as lantana (*Lantana camara*), and guava (*Psidium 182
guajava*). Only where the fallow period is about
four or more years in length do trees such as *Hibiscus* 137
tiliaceus and *Rhus simarubaefolia* (*Rhus taitensis*)
become established. Farmers in Ha'apai complain 241
that more work is now needed to control grasses 182
and other weeds, many of them in fact introduced,
and the metal push hoe, introduced into Tonga last 412
century, is now essential for land preparation and
weeding.

Soil erosion, another possible indication of stress, 241
is not a serious problem, and in Ha'apai and Tongatapu,
the most intensively cultivated groups, the 134
likelihood of erosion is restricted by the porous 182
soil, the underground drainage and the lack of relief.
On the other hand, it is widely believed that
soil fertility in the more densely settled areas, particularly
in Ha'apai, has declined with the increasing
intensity of land use. The majority of farmers questioned
in areas of high population density felt that
yields had declined and blamed the shortening of the
fallow period, while some also cited the increased
planting of coconuts as a factor. These beliefs are [125]
partially supported by the results of chemical analyses
made of Tongatapu and Ha'apai soils. On the

[p. 62-B]

basis of parent materials, relief and climate, Ha'apai 241
soils should ~~be very~~ similar to those of Tongatapu, 134
but in fact appear to have much lower levels of available 182
phosphorus and possibly slightly lower levels 125
of available potassium.[1] Soil analysis by itself, however, is not particularly conclusive, and no yield measurements or fertilizer trials have been made which might provide further evidence on the question
of differences in soil fertility. Any decline in 241
fertility that may have occurred has obviously been 134
only moderate. The soils of Ha'apai are by no means 182
nearly exhausted, and satisfactory yields are still obtained. During fieldwork it proved impossible to find a plot which farmers considered so depleted in fertility that it would have to be left fallow for more than about three years before reasonable
yields could again be obtained. There is also no 182
evidence to suggest that people in the areas of high 262
population density have a diet poorer in quantity or quality than elsewhere in Tonga.

While there has therefore been some deterioration 241
in the fallow vegetation and probably some decline 182
in soil fertility there are as yet no indications of
serious stress in the agricultural system. Food [134]
production per head may have been maintained by the
increase in the length of cropping in relation to [433]
fallow, and by the shift in crops, and it is significant that, despite their complaints of declining yields, hardly any of the farmers questioned in the areas of high population density seemed to feel any need
for changes in the bush fallow technique. The argument 241
that changes in methods of maintaining soil
fertility may not be necessary under Tongan conditions 182
therefore receives some support, but it is 134
not yet possible to determine whether the absence of serious stress reflects the ability of the soil to bear frequent cropping, or is more a result of the limited length of time the soil has been intensively farmed.

There are, however, further possible explanations 241
for the failure to adopt new techniques. The rate of 182

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[1] The samples were of the top 10 to 12 inches of *kelefatu* soils in the two groups. Ten samples were collected in Ha'apai and 21 in Tongatapu. The mean level of available phosphorus was 43 p.p.m. for the Ha'apai samples and 1052 p.p.m. for the samples from Tongatapu. The difference between these means is significant at the 2 per cent level. The mean level of available potassium was 373 p.p.m. in Ha'apai and 529 p.p.m. in Tongatapu, but this difference is not statistically significant. [126]

population growth over the last three decades, and 241
consequently the rate of increase in the intensity of
cropping, has probably been more rapid than the 182
rate at which Tongan farmers are willing to change
their established methods and particularly their
habits of work. By contrast, the more elaborate [171]
techniques used by the New Guinea agriculturalists
discussed by Brookfield (1962) and Clarke (1966)
appear to have been developed over a lengthy period
under conditions of slow population growth. Fur- 242
thermore, in the past the Department of Agriculture 654
has done very little experimental or extension work
on the problem of maintaining soil fertility under 182
food cropping, and most of the technical advice 241
given has concerned cash crops. Consequently many
Tongan farmers have little knowledge of the techniques that could be adopted, and unlike shifting
cultivators in some other areas they have had no
contact with peoples practising more advanced
systems of subsistence agriculture.[2] They also have 241
no tradition of livestock farming (except with pigs) 231
which could be developed into an intensive farming
system based on manuring, as is found in parts of 182
Africa.

The relevance of Boserup's thesis to the process 128
of agricultural change in Tonga may now be briefly
reviewed. While none of the material presented 114
above conflicts with her thesis that the intensifica-
tion of traditional agricultural systems occurs only 241
when forced by population pressure, for it is evident 182
that differences in the intensity of cropping in Tonga
are related to differences in population density
rather than to differences in land quality, it does
suggest some qualifications to her argument.

Firstly, not all of the adaptations made by Tongan 241
farmers to population growth have involved in-
creases in labour input, for one response has been 182
to adopt a high yielding and easily cultivated crop
such as cassava.[3] Secondly, a good deal of intensification seems possible without necessitating basic
changes in the agricultural system. Short-term in-

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[2] Compare the comments by Boserup (1965, pp.41, 64).

[3] On the other hand more labour is now required for clearing [433]
and weeding gardens and yields have probably been affected
by the decline in soil fertility, but whether the net result has
been a decline in output per man-hour is impossible to deter-
mine in the absence of data on labour inputs and production.

[p.63-B]

creases in population, resulting in say a doubling in the intensity of cropping, may therefore not bring about significant changes in agricultural techniques, even when quite high levels of intensity are reached. Thirdly, an imbalance between the rate of increase in the intensity of cropping and the rate of agricultural change may also be expected in areas experiencing rapid population growth, and where farmers have little knowledge of innovations which could be adopted, a situation which applies in other parts of the Pacific besides Tonga. 241 182 [171]

Probably the major limitation on the usefulness of Boserup's thesis under present Tongan conditions, however, is the fact that population growth is only one factor influencing agricultural change, for the increasing commercialization of Tongan life has affected the whole of the agricultural system. Involvement in cash cropping has helped to encourage the adoption of food crops which require less labour, and has added to the pressure on the bush-fallow system through the increased planting of coconuts, bananas and other crops.[1] 241 182 178 [245]

The current Coconut Replanting Scheme appears likely to modify further the food cropping system. Firstly, the increased density of palms resulting from new planting, and the restriction on cropping around each palm reduces the area available for other crops. Secondly, the need to keep down the bush growth around the new palms and to avoid any burning which would damage them places severe restrictions on the practices of bush fallowing and slashing and burning. Thirdly, if the Scheme's aim of high productivity is to be achieved and the maximum benefit gained from the selected seed nuts the continued use of fertilizers is essential and is being strongly encouraged. The eventual replacement of the bush fallow as the technique for maintaining soil fertility in Tonga may therefore be as much a result of the requirements of commercial agricul- 245 241 000

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[1] In times of good export prices farmers buy much of their food and subsistence cropping declines.

[p. 64-A]

KINSHIP AND BEHAVIOUR IN A TONGAN VILLAGE

121 of Tongatapu Island 16 miles from the capital, Nuku'alofa. This village
[101] was selected for field work because it is one of the most isolated villages in
Tongatapu and because it is supposed to have retained the traditional way
of Tongan life. The size of the village was also suitable for the study.
124 Although I tried to speak the Tongan language as much as possible for
my daily life, the information for the study was collected in English
through an interpreter who was nineteen years old.

I The Village

The People

162 According to the Government census of 1956[5] the population of
161 Nukuleka was 209 (107 males, 102 females). There were 219 (109
621 males, 110 females) by my enumeration in December 1962. In spite of
the rapid population growth of the Kingdom in recent years, the increase
621 of population of this village has been slight. Among these 219 persons,
162 there are 15 temporary residents made up of two families whose heads
serve as the stewards for the two different churches in this village. These
621 15 residents being excluded, 204 is the village population. Of these 37
166 were born outside the village (male 10, female 25 and children 2). Eight
married men have come from elsewhere and two younger single men live
[162] at the home of relatives. The 25 women are married to the villagers. The
two children were brought here on their mother's second marriage.
Against the 37 who moved in, there are 36 who moved out of this village
(male 13, female 23). This figure is the number of persons who are
brothers and sisters of the present villagers and were born in Nukuleka but
now live elsewhere. It is difficult to count the moved-out otherwise. Most
of them, especially women, married out, and a few left the village because
they received land in another place or because they were adopted by the
relatives.

All the inhabitants are Tongan. There are 49 adult men over sixteen
621 years of age who are old enough to be entitled to receive *api tukuhau*, tax
423 allotment, and *api kolo*, town allotment, and at the same time are obliged
[651] to pay poll tax according to the Tongan law. The village had been the
[659] noble estate held by S. Pangia, but the Government took over direct control in the 1920s.[6] Simultaneously, the Government confiscated extra
land from the men who had had larger *api tukuhau* and redistributed
them to more villagers. Today, however, only 28 villagers have *api
tukuhau* of about 8¼ acres each. A further 21 who are entitled to it have
not yet received it. The latter borrow the land to cutivate from their
[463] relatives or friends. Therefore, all men, without exception, are working
[241] the land.

Besides agriculture, the villagers are engaged in fishing. The village
621 location being favourable to fishing, a number of men go out to sea nearly
226 every day. Most of the fish are consumed within the village, but a few
[432]

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[5] Report on the Result of the 1956 Census by Authority, 1958.

[6] In the map after Gifford (1929) Nukuleka was a noble estate held by Paniga. A villager told me that the Government had examined the documents of the village in the law court and had taken it lawfully from him, although I could not find the record in the office.

men of enterprise who use a *pa* trap for catching fish sometimes sell their 621
catch to the villagers or to the people of Mu'a, the ancient capital of the 226
Kingdom lying 3 miles south of Nukuleka. 432

Eiki Tevita Leka

The high chief of Nukuleka is Tevita Leka, a *matapule* of the present 622
Queen. His family have been sailors of the Tui Tonga for generations. 173
There is a story about his ancestor. Long ago, a daughter of the Tui [643]
Tonga became pregnant, but did not disclose her lover's name. Getting [644]
angry, the Tui Tonga was going to kill her, when Haavea Leka, a
matapule of Ha'afeva island in Haapai, came in and asked permission to
take her with him to his own island. On departing, Haave asked the Tui
Tonga as a special favour to name the baby Leka and make him *toutai*,
a sailor, of the Tui Tonga, if the baby should be a boy. The Tui Tonga
later called the boy Leka back to Hu'a and made him a chief sailor of
the *kalia*, a double canoe, named Lomupeau.

The genealogical distance between this first Leka and the present
one is not clear, although Tevita Leka can identify six generations before
him. Many years ago, the Tui Tonga ordered Leka to reside in this [643]
village which was formerly called Nuku. The messenger from the Tui
Tonga to Leka often lost his way, for there were a number of places
named Nuku in Tonga. The name Nukuleka was then given to avoid the [103]
confusion.

Today Leka lives in the same way as an ordinary villager, working 622
his own *api tukuhau* of 8½ acres, and sleeping in a house thatched with [511]
plaited coconut leaves. But he is of the highest rank among the villagers [341]
and none is able to take a seat above him. Even in a church a chair is [342]
reserved for him beside the pulpit. As *matapule* of the Queen, he [554]
announces the order of the Queen to the villagers. He may ask the [796]
villagers to offer pigs, yams and *pola* (plaited coconut leaves used as a 622
food tray) piled with food cooked in the earth oven, on special occasions 644
like the birthday of the Queen or the two princes or on the feast to an [565]
honoured guest. Sometimes he visits the palace in the capital to serve [661]
the guest of the Queen. When the Queen visits other islands of the
Kingdom, he may follow her as his ancestor did. But his most important 796
duty as a *matapule* is to attend the *fai kava* given by the Queen which is 574
usually held on her birthday in the palace or in the open space in front 644
of the palace. The order of drinking *kava* is as follows; the Queen, 672
Lauaki, Motua paka, Noble Nuku, Noble Luani and Tevita Leka.(7) 565

In the village life Leka has a special role in catching the *ika faka* 622
fonua, literally 'the fish of the village". The *ika faka fonua* of Nukuleka 226
is the *matai*, a hammer-headed shark, that comes near the coast from
October to March. If the *matai* does not appear in this season, Leka [782]
goes to the graveyard to offer *kava* roots and to pray to his ancestor. This
prayer will be heard without fail. Anyone who sees a *matai* out to sea
calls "*Matai, Matai!*" when all the villagers gather on the beach, and men
both young and old sail out with sticks and paddles in their hands. As
soon as Leka hears the call of *matai* he hurries to his home. While they

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7. This seat-ordering which Leka indicated is not different from the *kava* ring cited by Collocott. Collocott 1927: 28.

426 423 are not reluctant to ask for help from their *famili;* one may *kole* (ask)
621 foods, money, land use for cultivating or housing, and so forth. And one
612 who is asked for something by one's *famili* would not refuse it. In case
[241] they borrow a portion of *api tukuhau* of their *famili,* they can usually
plant and harvest any crop they like. The only exception is that the
[245] borrower has no right to get the coconuts from trees already planted. The
[434] coconuts are the chief source of the cash income for the villagers. When
[427] I asked them "What do you pay for the use of the land?" a common
answer to this question is that he (she) is my *famili,* which suggests their
idea that they do not have to pay to their *famili.*

Prohibition of Marriage

612 Marriage prohibition extends bilaterally towards the farthest relation-
582 ship. If two persons recognise themselves as belonging to the same *famili,*
even if their actual relationship may not be traceable, they must not
marry. A man and woman in the same generation in the same *famili*
stand as brother and sister; the former should respect and protect the
588 latter. But in a different village, I know of a couple consisting of a man and his father's (classificatory?) sister's son's daughter. The story about their marriage is as follows. They had lived in the same village and the boy fell in love with her. Every time he came to see the girl, her parents suspecting their immoral love, sent him away. But one day they ran away to Nuku'alofa to get married. After they came back, the bridegroom and his father visited his wife's parents, taking with them food which had been cooked in an *umu.* Then on the evening of the same day, her mother brought bark cloth and mats to their house for the bridal bed. Now, they are apparently not blamed either by their parents or by the villagers because of the run-away marriage, and her mother was not ashamed to tell me the story. Anyway this remains an exceptional case.

612 *Famili* functions in a field of co-operation and marriage and prohibition. On the other hand a *famili* organisation does not necessarily operate at all since the group for co-operation need not extend beyond the household. A person needing another's help, may ask the members
[571] of his *famili* individually. In short, in the Tongan way, more emphasis is put on the interpersonal, individual relationship than on the group relationship. The next chapters will report the kinship behaviour centring upon the relationship between individuals.

V The Interpersonal Relationship

Kinship Terminology

601 The terminology of Tongan kinship system has already been precisely
114 described by Gifford, I will touch on some variations from his statement. He wrote about *tamai* that all male and female relatives of the father and in his generation are said to be called fathers.(15) But so far as I could know, this usage of *tamai* is not so extensive today. It includes the father and the father's brothers in classificatory sense, but not female relations of the father. In the same way, I am not certain if *fa'e* includes

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15. Gifford 1929: 28.

131 Tongatapu and 'Eua islands and a few smaller islets. The
131 Ha'apai Group consists of numerous small atolls. Fifteen of
162 161 these were inhabited at the time of the 1966 census. The
total area of the atolls of Ha'apai that were inhabited in
1966 is 20.1 square miles, with a population density of 521
131 per square mile. The Vava'u Group lies to the north-east
of Ha'apai. Like Tongatapu, it has a main island that gives
its name to the Group and a cluster of atolls nearby.

The distance between Nuku'alofa and Neiafu, the main
towns of Tongatapu and Vava'u, respectively, is 165 miles
(usually a matter of three days' journey on the government
132 passenger vessel). Within this distance the climate varies
from tropical in the northern islands to sub-tropical in the
south, with a mean annual rainfall of 86 inches in Vava'u
and 67 inches in Tongatapu (although with considerable
variation from one year to the next).

Yams, taro, sweet potato, manioc, breadfruit, bananas,
241 [184] plantains, coconuts and watermelons are grown throughout
Tonga, albeit in differing proportions in different parts
of the country. Except for breadfruit, these crops yield
all year round, and all but watermelons are important
241 subsistence crops. The principal cash crops are bananas,
433 [439] coconuts and watermelons. Bananas and coconut products
(copra and dessicated coconut) make up more than 90% of the
value of Tonga's exports. The nation's economy is based on

241 433 peasant production; the value of subsistence crops produced for local sale is negligible.

Population

161 [162] The population of Tonga at the census of 1966 was 77,429, of whom 98.31% were classified as Tongan (in contrast to others such as Europeans, part-Europeans, and other Pacific Islanders (Fiefia 1968: 7). The population total reflects an annual rate of increase of 3.24% in the period since the previous census, which was held in 1956, compared with 2.94% during the preceding intercensal period, 1939-56. [163] [165] The difference is explained not so much by any great change in the birth rate as by a reduction in the death rate. Table 1 shows population totals over a period of about fifty years, beginning with the census of 1911, the earliest census for which there are published figures available.

Population projections made by Norma McArthur, an Australian expert in Pacific demography, indicate an estimated population of more than 100,000 by 1975 and more than double the population of 1956 by 1980 (Kingdom of Tonga Economic Survey of Tonga 1970: Appendix A.1). These projections, based on the findings of the 1956 and 1966 censuses, assume the maintenance of age-specific fertility rates and continued slowly falling mortality rates, with no significant outmigration. McArthur's projections appear to be slightly on the high side, for her estimate was that the

[TEXT CONTINUED ON PAGE 40]

this is only because there has been considerable migration 161 162
from these islands. 166

It would seem, then, that insofar as there has been 161
pressure resulting from increased population, this has been 368
concentrated in the Nuku'alofa area. To that extent, the
problems of increased population in Tonga are mainly the
problems attendant on rapid urbanization. However, that is 166
not the full story, for the movement to Nuku'alofa is 423
largely related to the landless condition of many of those 162
who have migrated (Walsh 1969). According to the census 162
of 1966, 52% of all adult males (i.e., men aged twenty and 423
over) had no land to their names, whereas two-thirds of
the men living in the Nuku'alofa area were landless.
Unfortunately, there are no comparable statistics available
for 1956, as no question about land ownership was asked in
that census. There is no doubt, however, that landlessness
is a growing phenomenon, related to rising population. This [561]
can be seen , for example, in the figures on land-holding,
which shown an inverse relationship between landlessness and
and age (see Table 3).

The significance of increasing landlessness stems from 162
the fact that Tonga is largely a country of peasant 423
proprietors, of people engaged in agriculture for household 241
consumption and export who work on land that is under the
control of a member of the household. In the census of
1966, 70% of all Tongan men between the ages of twenty and

[TEXT CONTINUED ON PAGE 46]

sixty were classed as being engaged primarily in agriculture 162
for household consumption and export. This is a figure for 423
the total population, including men who reside in the towns. 241
As Walsh points out in a paper entitled "A Tongan Urban
Peasantry?",

> Town dwellers are inescapably bound up with the land. They own it as much as villagers, they rely on it to supplement wages kept low on the assumption of an additional income from agriculture, they value it as a means of fulfilling family obligations and as a measure of their social importance and they depend on it for food (1969: 93). [465]

The figures on external trade (quoted earlier) further 439
indicate the role of agriculture in the Tongan economy: 423
throughout the 1960s, bananas and coconut products made up over 90% of the value of Tonga's exports. Furthermore, there are no grounds for anticipating the development of non-agricultural exports on any significant scale. In the 315
late 1960s, much hope was based on the possibility that explorations for oil would prove fruitful. This has not yet materialized, however. And in trying to develop non- 439
agricultural industries, Tonga is in the difficult position of having to compete with Fiji and Western Samoa, both of which enjoy relatively large home markets and are also more advantageously placed to export their goods.

In view of Tonga's dependence on agriculture both for 311
subsistence and export, the rising population figures are 161
cause for concern about increasing pressure on land as an 241
agricultural resource. A figure for 1963 gives the extent [134]

of land suitable for cultivation as amounting to 92,447 311
acres, approximately 60% of the total land area (Great 161
Britain 1965: 21), and it is unlikely that arable land can 241
be increased significantly. This means that higher yields [134]
of subsistence crops are required from existing acreage if
the extent of land under cash crops is not to be reduced,
and geographers have already documented changing patterns
of land use and cultivation in Tonga (Maude 1970, 1973;
Thaman 1976).

The question arises whether there is a shortage of 423
land. 'Land shortage', however, is not something that can 121
directly and unequivocably be infered from figures on
population density. Rather, it implies a scarcity of land
to meet local needs given the available technology, and
varies with the definition given to 'scarcity' and 'local
needs' as well as being dependent upon practices of land
use and the level of technology. In the case of Tonga,
however, the definitional problem falls away, for there is
a readily available index of land shortage. According to 423
Tongan law, every Tongan male aged sixteen and over is [651]
liable for an annual poll-tax, and every poll-tax payer is
entitled to an allotment of agricultural land measuring
100 fathoms by 100 fathoms (approximately 8¼ acres).
Whether there is sufficient land to provide these allotments [162]
can be taken as a criterion of whether or not there is a
shortage of land, and by this criterion there is a definite

REPORT ON THE RESULTS OF THE 1966 CENSUS

Kingdom's total population, had 58.9% of the total households with two
161 family units and 63.2% of the households with three or more family units.
162 The Report does not distinguish whether households with several
592 families have come about as a result of grandparents, son and wife, and grandchildren living in the same household, or as a result of brothers and their wives sharing one household. It is also unclear how the local census officers demarcated dwelling units clustered together and cooperating as the one single household. In many parts of Tonga there is a precedent in custom for three or even four generations of the same kin-group to live within the same *'api*, the family unit of the oldest son occupying the main dwelling with other units (parents and unmarried siblings; families of
[593] married siblings) having separate dwellings around. Because of the
traditional brother-sister *tapu* there may be an additional hut for unmarried sons. There is less precedent in Tongan custom for two or more family units of the same generation (e.g. siblings, their spouses and children) to live within the one dwelling: this could be a criterion of overcrowding.

It seems from the census figure of 16% ("households" with more than one family unit) that overcrowding is not yet severe in Tonga except in
[342] Nuku'alofa. Here families of siblings are sharing dwellings, and huts are
being built on swamp land. Elsewhere, the occurrence of households containing more than one family unit may be accounted for as the persistence of the traditional co-resident extended family, comprising several generations where each "extra" family unit may have its own separate dwelling house which may or may not have been recorded in the census schedule as a household. The increase in average household size has been accompanied by a fall in average overall acreage of land per household from 15.08 acres per household in 1956, to 10.98 acres in 1966.

* * *

The population densities already discussed have little meaning except
121 in relation to the availability and utilization of natural, agricultural and
13 human resources. The natural resources of Tonga comprise almost
311 exclusively the soils, reefs and surrounding seas with, in late 1968, an elusive possibility of oil; the agricultural resources comprise almost entirely trees—particularly coconut, banana, breadfruit—and ground crops grown mainly without mechanical aids by slash-and-burn methods.
128 Human resources are discussed at the end of this paper.

Dependence on agricultural produce is enormous; in 1961 and 1964
433 these products amounted to 98.19% and 96.39% respectively of Tonga's
[439] total export earnings with copra (the dried kernel of the coconut) forming
the basis of the economy and constituting over 80% of the visible exports
[241] throughout the 1960s.(6) Agricultural products are the surpluses and
small cash-crops of Tonga's 12,000 or so peasant farmers who are scat-
[463] tered throughout the Kingdom and rent their allotments either from titled
[427] nobles or directly from the Government.

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6. Tonga, 1960–1967 *passim*. Total exports for 1961 amounted to £T1,374,658; agricultural exports £T1,349,461; non-agricultural exports £T25,197.

WEDNESDAY 21st. The next morning I took a walk into the island, 241
which I found to be finely laid out into Plantations that were ex-
treemly well Cultivated and planted with such roots and fruits as [177]
are common to the island, and I made some addition by sowing the
seeds of Indian Corn, Millons Pumpkins &c^{a}. All the Plantations [417]
were finced round and publick roads lay between them. When I went
on board to dinner I found a large sailing Canoe fast to the Ships [491]
stern; in this Canoe was *Latouliboula* who, we understood, was King
of Tongatabu when I visited the island last Voyage.[1] He sat in the 648
Canoe with all that gravity by which he was distinguished at that 644
time, nor could I by any means prevail upon [him] to come into the
Ship. The people called him *Arekee* which signifies King,[2] a title I had [554]
never heard one of them give Feenough which made me suspect he [634]
was not the King. Latouliboula remained under the stern till the
evening when he retired to one of the isles. Feenough was on board
at the same time but neither took any notice of the other.

THURSDAY 22nd. Nothing material happened the next day, except- 648
ing some of the Indians stealing a Tarpauling and some other things
from of the deck, they were soon missed and the thieves pursued, but 685
a little too late, I applied to Feenough to have the things returned, 634
he refered me to Earoupa and he put me of from time to time and at
last nothing was done.[3] In the morning of the 23rd as we were going to 23rd

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evening with a dance, by some of their dancing Women, who are early trained to it, for the [648]
entertainment of the great.—The principal Women who have at all times an Air of conse-
quence & dignity in whatever they do, never perform among them; the dancers were upon 541
this occasion particularly well dress'd after their manner, which consists of a large piece of
their cloth of a brown colour, first doubled, & then with great exactness folded on the 533
upper part into about thirty plaits, & tied with a kind of ribband made of the leaves of the
plantin tree, dyed of different colours, round their waist, their hair is adorned wth a 535
variety of flowers, & the upper part of the body rub'd over with a perfumed Oil: from the 177]
stiffness of the cloth, its being plaited, & the manner it is put on, they look like persons
just springing out of a cask; in these dances the Women have a variety of figures, all [292
which they perform well, but with great labour to themselves: the custom of going with
the upper part of their bodies naked is thought no way indecent, as the frequent view of 301
the persons so expos'd rather checks than incites every loose appetite, to us the appearance
of those women who had bore many children was rather disgusting; but our ideas of 302]
disgust were soon changed into that of admiration when We beheld the most beautiful
forms that imagination can conceive in the younger part of the Sex.'—Williamson.

[1] Latunipulu, the male *Tamaha*, the man of 'sullen and stupid gravity' whom Cook met in October 1773 at Tongatapu.—II, pp. 256–8:—'a chief whose odd and wild manners attracted our attention', says King. He would not trust himself in the ship, but 'he was very eager for our curiosities, & if trust'd into his hands woud not return them, his attendants however settled the prices.'—King, 22 May.

[2] '*Eiki*, a chief, a lord; or head of a family. The Maori *ariki* (a first-born in a family of note) may have been in Cook's mind. Other journals render the word as 'agee' or 'egee'.

[3] Both sides suffered. 'Punish'd Chris^{r} Kervin with 12 lashes for losing his ramrod (which I believe the Indians stole) during the Time he was Centinel, purposely to prevent their committing any thefts.' Next day Thomas Stretcher got 6 'for suffering the Indians to steal his Boathook'.—Clerke, 21, 22 May. Next day again 'Punished one of the Indian chiefs with 15 Lashes for Theft. Had we made an Example of every one of these people that deserved it, Punishments wou^{d} have been Endless, for their Skill in Pilfering is almost past

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122 with beating about amongst the islands and shoals as they were and
determined to get to an anchor some where or a nother if possible.
[133] While the boat was absent, we attempted to turn the Ships through
the Channel, between the Sandy isle and the reef of Ogodoo, in expectation
of finding a moderate dept[h] of Water behind them to
anchor in, but meeting with a Tide or Current against us were
obliged to desist and anchor in 50 fm water with the Sandy isle
[648] bearing EBN one mile distant. We lay here till the 4th during this
time we were several times visited by Fattafee the King, Tooboweitoa,
[649] and people from the neighbouring island[s] came off to trade
[439] notwithstanding it blew very fresh most of the time. The Master was
sent to sound the Channels between the islands to the Eastward and
I landed on Ogodoo to examine the island and take a View of the
134 Shoals or reefs about it. I walked all over it, the north part is low
land, the soil composed of Sand and Mould. The South end is elevated
[133] and the soil a red sandy clay without a stone, every part is
[311] cultivated and there are some pools of dirty Water on the low ground
[312] and all of them more or less brackish.

Wed. 4 On the 4th at 7 AM we wieghed with a fresh gale at ESE and stood
Thur. 5 away for Anamocka where we anchored the next Morning nearly in
122 the same place where we lay before. I landed soon after and found
the Inhabitants very busy in their plantations diging up yams to
439 bring to Market, they were now in the greatest perfection and we
procured a good quantity for pieces of iron. Before I returned on
● 241 board I visited the several places where Mellon seeds & plants
177 had been planted and had the Mortification to find that the most
of them were distroyed by a small ant,[1] but [the] Pine-aple plants
Frid. 6 I had planted were in a flourishing state. About noon the next day
164 Feenough arrived from Vaughwaugh he told us that several Canoes
122 laden with hogs &ca that sailed with him from the island were
lost in the late blowing weather and every soul in them perished;
but as this melancholy tale seemed not to affect any one of the
Indians, I did not beleive it; yet it might be, for it had blown hard
for these parts, in so much that the King and others at Ogodoo durst
not venture to Sea when we did, but desired I would wait for them
at Anamocka which was the reason of my anchoring there the second
Sat. 7 time. The following Morning the King and all those who had been
643 wind bound with him arrived, I was at this time a shore with Feenough
648 and left him to visit the other; who I found seting with a few
634 people before him, but as several came to pay their court to him

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[136] [1] The ant in Tonga is called *lo*; but there are more than one species, so that it is impossible to identify the criminal.

which on most occasions was our interpreter had either been missinformed 648
or what was more likely had missunderstood them for in 643
this affair we had been labouring under some gross misstakes, this
Marriwaggy, tho a great man yet was by no means superior to [124]
Fattafee Polaho. I was now very sorry I did not make a longer stay
at the place we went to; it was a Villige most delightfully situated 361
on the bank of the inlet, where all or most of the great men in the
island resided, each having his house in the midst of a small plantation,
with lesser houses and offices for servants &c^a. These plantations [417]
were all neatly finced round, with for the most part only one
entrance which was by a door that was generally fastened on the
inside by a shore or prop of wood, so that a person has to knock
before he can get admittance. Publick roads and narrow lanes lay [491]
between every plantation, so that no one trespasseth upon another.
Great part of some of these plantations were laid out in grass plats, 241
and planted with such things as seemed more for Ornament than
use; but hardly any were without the Cava plant on which they
make their favourate drink, and some were planted with every thing
the island produceth, but I observed these were not the residence of
people of the first rank. There were some large house[s] near the 344
publick roads uninclosed with large smooth grass plats before them;
these I was told belonged to the King, they seemed to be common 351
to every one and were probably the places where they have their
publick assembl[i]es. On our first landing we were conducted to 648
one of these houses where we seated our selves according to the Custom
of the Country and in a short time had a very numerous assembly
who very orderly seated themselves in a simicircle before us, not one
attempting to come near us unless desired.

FRIDAY 13*th*. About Noon the next day this Mariwaggy we had 648
heard so much of actually came, and with him a very considerable
number of people of all ranks. In the after noon a party of us accompaned 643
by Feenough went to pay him a visit; we found him amongst a
great number of peop[l]e of both sex Seated round a large piece of 648
Cloth, not less than 40 yards in length, spread out on the ground. At 643
the upper end sat an elderly Chief named Toobough, which for distinction 644
sake I shall call old Toobough,[1] him, from the place he was [634]
seated, we took to be Marriwaggy till undeceived by Feenough, who
interduced us to him seated on one side; he received us very kindly
and desired us to sit down by him; he and also Toobough had a very
venerable appearence, both being grey with age. The meeting with

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[1] i.e. a different Tupou again, and a more important one: see p. 129, n. 1 below.

tops of the Mounts round the houses, there were a few rude Images 764
of the human figure, of different ages. We were told they were there
as monuments to the Memory of the dead and not the representation 532
of any Deity.[1] Such monuments they seldom raise for these seemed
to be very old. In one of the house[s] was the Carved head of an 764
Otaheite Canoe which had been driven a shore on their coast and
deposited here. After dinner, or rather after we had refreshed our
selves on what we carried with us, some of us took a Walk into the 648
Country making a pretty large circuit attended by one of the Kings 644
Ministers,[2] our train was not great as he would not suffer the rabble to
follow us, he also obliged all those whom we met to sit down till we [576]
pass'd a respect due only to their Kings. We found by far the greatest
part of the Country cultivated and planted with one kind of pro- 241
duction or a nother and the most of these plantations were fenced [417]
round. Some old Plantations lay uncultivated or in fallow, and there
were places that had never been touched but lay in a state of Nature [313]
but even these places were usefull in affording them timber &ca with
which they were generally covered. We met with several large un- 491
inhabited house[s] which we were told belonged to the King or the
Lord of the Manor;[3] there were many publick and well beaten roads [487]
and as many foot paths leading to every part of the island. The roads [565]
were good and the Country level consequently traveling was easy.
On the most elevated parts, we met with coral rock close to the sur- 133
face, perforated and cut into all those inequalities we see them in the
wash of the sea, yet these very rocks with hardly any soil upon them
were covered with a luxuriant vegetation. We were conducted to 312
several little pools and some springs of Water, but the most of them
were either stinking or brackish tho recommended as excellent.[4] The

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[1] These three mounts seem to have been the great *langi*, called Tuoteau, Katoa and Tuofefafa, with a smaller fourth one in front, unnoticed by Cook, called Tauatonga. Cook does not mention stone-work, apart from the wall, so the stone of the *langi* may have been heaped over with earth. These lay to the north of the eastern side of the great *mala'e*, and in front of them was a smaller *mala'e*. Within them were the stone vaults or burial chambers. The houses, *faletolia*, were set up to protect the central part of the covering of fine black volcanic pebbles, called *kilikili*, which marked a vault. The information about the 'rude Images' being 'monuments' or commemorative figures was probably correctly gathered: cf. II, p. 251. The Tongans did not carve representations of their gods.

[2] No doubt a *matapule*, one of the non-chiefly but important officials on whom administration so much depended, attendant on a chief and sometimes his spokesman.

[3] By 'Lord of the Manor' Cook presumably means an *'eiki*, a great chief or 'noble', whose power, under that of the Tu'i Tonga, was territorial, as well as extending to the persons of the common people.

[4] Williamson, 20 June, provides a dissenting opinion: '. . . I have great reason to think that fresh water might be had by sinking a well at some distance from the lagoon, & am the more confirmed in this opinion from the many wells of delightful water, which we met with during our prerigrinations, some not less than thirty feet deep, & made extremely neat & clean.'

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333 of a sting-ray fited upon a piece of wood, served as a polisher; for
[412] small work they make use of Sharks teeth and Shells.

[237] *Tillage* The Instruments for *Tillage*, in which they may be said
to vie with Europeans, are nothing more than Pickets, or
Stakes of different lengths according to the depth they have to dig,
241 they are flaten'd and sharpened to a edge at one end and the largest
412 have a short piece fastened transversely a little above it, for pressing
it into the ground with the foot. With these, though they are not
more than from two to four inches broad, they dig and plant ground
of many acres in extent.

721 *War and Weapons* The art of War is not unknown to these people
though perhaps they practise it as little as any
nation upon earth; for except their occasional disputes with Fidge[e],
713 before mentioned, they seem to have no Enimies round them. Their
Weapons are clubs of defferent sorts, in the making, or rather Orna-
411 menting of which they spend much time, Spears and darts; they have
531 bows and arrows but they seemed to be designed only for amusement and not as a Military weapon.[1]

642 *Goverment* Of the nature of Goverment we know no more than the
general out line, a subordination is established among
them that resembles the feudal system; but of its subdivisions of the
Constituent parts and in what manner connected to form one body
[643] politic I confess my self totally ignorant.[2] Some have told us that the
power of the King is unlimited and that the life and property of the
[565] Subject is at his disposal; but the few circumstances that fell under
[421] our observation, made more against than for a dispotic Goverment
though we saw instances of both, and some that clearly shewed that
the lower order of people have no property but at the will of their
643 masters.[3] On the other hand *Marriwaggy*, Old *Toobough* and *Feenough*,
634 acted each like petty Sovereigns and frequently thwarted the meas-

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[223] [1] They shot pigeons with them, as an aristocratic diversion.

[565] [2] Not without reason, considering the complicated nature of the Tongan power-structure. I do not annotate some of the sentences that follow, in which Cook repeats statements already annotated, however erroneous they may be.

[517] [3] '. . . we saw instances, where present Passion seem'd to be their only guide, & where had they killd the Objects of their wrath they woud have been amenable neither to justice nor to a superior; but as the common people by no means appear dispiritd or any way broken by harsh or cruel treatment, It seems pretty certain that the mildness & benevolence of their masters, insures them against an ill use of their Authority. . . . Upon the whole the Friendly Islanders have the appearance of enjoying most of the Advantages aris'ing from a regular Government, few even surpass them in the great order they observe on all Occasions, in their ready compliance with the Commands of their Superiors, & the great harmony which subsists amongst all ranks; & none in the general sweetness & mildness of their tempers. We see many things worthy of imitation, few of blame; wou'd to God they cou'd say the same of us, but we have left them an incurable disorder which will for ever embitter their quiet & happy lives, & make them curse the hour they ever saw us.'—King.

is of a steep rugged coral rock nine or ten feet high, except the two 133
sandy beaches already mentioned, which have a reef of rock extended
from across their entrance to the shore and defends them from the
sea. They make excellent harbours for boats but it is difficult to get
in at low water, though at that time it is easy landing on the rocky
shore without if the weather is moderate. On the SE side which the [132]
Master examin'd is a fine sandy beach with good anchoring &
landing, but it is expos'd to the ESE wind which blows almost
constantly and sometimes pretty fresh, from whence it can scarcely
be preferable to our anchoring place, the best part of which seems just
to the W^t^ward of the largest sandy beach, as appear'd from the
Discovery lying foul by being a little the other way. In the centre of
the isle is a large Salt lake about a mile & a half across, round which
the land rises like a bank with a gradual ascent; but we could not see
any communication it has with the sea, though from the low land
that runs across to it from the largest sandy Beach and the sandy soil
it would appear it may have once communicated that way. There is
another lake or pond, but much smaller, a little way from the shore
on the left hand of the sandy beach from which we took our water,
and though brackish may if taken up after rain (a great deal of which
luckily happened just before our arrival) answer the purposes of a
ship sufficiently. The soil on the rising parts of the island & especially [134]
towards the sea is of a reddish clayey disposition or a black loose
mould, but there is no other water than the pool already mentioned, [312]
except in some small holes dug by the natives near the last which
afford much better water than the pool itself.

It is very well cultivated except in a few places, and there are some 241
others which appear to lye waste but are only left to recover the
strength exhausted by constant culture, for we have seen them
frequently breaking in these spots to plant again. The plantations 245
consist chiefly of Yams and plantanes, many of which are very 417
extensive and often inclos'd with neat fences of reed dispos'd ob-
liquely across each other about six feet high. Within these are 244
frequently seen other fences of less compass which surround the
houses of the principal people, but for the most part these are found

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can compare high land, and shall therefore say that it is the next in degree whether with respect to the whole body of land being high or its being interspers'd with high hills. Very high or mountainous land cannot be easily comprehended in a single definition, but may be understood by its always exceeding the other & adding some particular description of its height.

It should be observd that the criterion of low land mention'd above can hardly be applied to Annamooka and some of the isles about it, but I have considerd them as low merely to avoid confusion, as they cannot be admitted to the rank of those of a moderate height which we have yet seen, as Wateeoo & Mang'ya.

A [of Nomuka--Analyst]

SUNDAY 18th. The wind E . Moderate breezes with good weather. 114
The Gunner was employ'd to trade on shore and purchas'd a good
many hogs, plantanes &c but the greatest supply we had was a 439
present which Fee'nou made the Captain of a vast quantity of Yams, [634]
Plantanes, Sugar cane &c and two hogs, which was shar'd between
the two ships. Amongst other things we purchas'd yesterday a fine [491]
green Turtle of above 300 Lib., & to day the decks were so crowded [648]
with the natives who came to barter or were incited by curiosity that
it was almost impossible to stir. [609]

MONDAY 19th. The wind Easterly. Gentle breezes with fine weather. [132]
We continued to barter with the natives on shore as yesterday and a
great number were on board.

As we wanted to obtain some knowledge of the country some of us 609
mention'd it to Fee'nou, who sent a person as a guide and to protect
us from any insult from the natives. We travers'd nearly the whole 114
island of Lai'fooga and found it in several respects superior to Annamooka.
The plantations were both more numerous and extensive and 311
we found large spots well planted with the Morus papyrifera (paper
Mulberry),[1] but in many places towards the sea, especially on the east
side, the country is still waste owing perhaps to the sandy soil, as it is
much lower than Annamooka or its surrounding isles. Towards the [194]
middle of the island the soil is better and much better inhabited than [162]
the other parts, for we met here with very large plantations, fenc'd in
in such a manner that the fences running parallel to each other form'd [241]
fine spacious roads that would appear an ornament in the most [417]
civilizd countrys. It however labours under the inconvenience of [487]
having no good water that we could see, for though we found several
ponds the water was either very brackish or stinking, and in some 312
large holes in the coral rock which is seldom above two or three feet
from the surface it was no better than common sea water. At one 223
place we saw an artificial mount rais'd to a considerable height with
an arbour of low trees neatly contriv'd, under which our guide made 349
us understand people sate to catch pigeons.[2] At another place was a
house four or five times as large as the common sort with a large area 344
of grass before it which seem'd a place for the people to resort 764
publickly to;[3] and near the landing place we saw one of their burying 349
grounds, which was a mount two or three feet high coverd with
gravel and had four or five small huts on it, in which they said the
bodys of some of their principle people were interr'd.[4] Most of the 000

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[1] *Broussonetia papyrifera*, Tongan Hiapo.

[2] One of the mounds called *sialupe*.

[3] Tongan *mala'e*.

[4] A *fa'itoka*.

114 Annamooka bore the island on this side making in two or three low hummocks. Between eight and nine we anchord in the same spot we left on going to Hapaee but the Discovery was still three or four leagues to leeward and did not get up till three in the afternoon.

439 The Captain went on shore before and after dinner and the natives to about the number of two hundred assembled on the beach & traded with as much eagerness, if not more so, than if we had not [241] been there before. Their stock appear'd to have been recruited much in our short absence but instead of bread fruit, which was the only article we could purchase on our first arrival, nothing was to be seen now but yams & a few plantanes, which shows the quick succession of the seasons or at least the different Vegetables produc'd at the 164 several times of the year. We found the cold mention'd at Kotoo quite universal here & seems a disorder they are not much acquainted 634 with. These people in the absence of Toobou whom we left at Kotoo seem to be under little subordination, for we could not perceive to 166 day that one man assum'd more authority than another. It appears also that a great many of the principle men and women whom we saw here at first had come from the other isles, as few or none were seen now.

132 FRIDAY 6th. The wind E and ENE. Fresh breezes with cloudy weather in the forenoon but afterwards clearer and more moderate. Very few 439 Indians came off to the ship but they traded on shore as usual, which brought us a seasonable supply as our Vegetables were almost 634 exhausted (though we had plenty of hogs) on coming in here. In the afternoon a large Canoe came with Feenou, who reported that 648 several Canoes which he was bringing with hogs and other things from Va'vaoo were lost in the late strong winds. We were now too well acquainted with his character to give much credit to such a story but easily overlook'd it from the service he had been of to us before. [643] The truth probably was that he found himself unable to procure the things at Va'vaoo which he expected, or if he did get any and heard at Hapaee which lay in his way back that Poulaho had been with us he might leave them there, as he doubtless knew the merit of procuring them would have fallen to the share of his superior though he had been at the trouble. He was however in that case obligd to frame a story, that it should not appear he had broke his promise to Captn [643] Cook and to procure him a civil reception at his return. He seem'd to be sensible of the error he had committed in assuming the character of the first person in the country, as he not only acknowledg'd

Poulaho to be King of Amsterdam & the other isles but seem'd to 634
insist very much upon it, perhaps from a fear of offending the other 648
when he should hear of his former presumption.

The inhabitants have been very busy in cultivating while we were 643
absent for they have made several large Plantane fields in places that 245
were waste at first. We observ'd here as well as at Kotoo a good many
of the small hillocks where the Yams are planted strew'd with a little 244
white sand, which they say are those intended for the use of the chief. 565
The Melons which the Captn sow'd here have come up but are mostly 137
eat by small insects & some of the Pine apples left with Toobou seem
to be in a thriving state. 177

SATURDAY 7th. The wind ENE. Fresh breezes with fine clear weather. 241
In the forenoon Poulaho came from Kotoo and we could at once see 132
his superiority to Feenou on meeting him, for the last plac'd himself
down in the circle that sat before Poulaho as an indifferent person. 643
He seem'd at first rather abash'd as some of us were present who had 634
been us'd to see him as a different person, but he soon recover'd [576]
himself & both he and Poulaho went on board with the Captain. He
behav'd there much as any of the others that attended Poulaho, [644]
saluting his foot with his head and hands and could not ther[e] eat [576]
nor drink before him.

A few Canoes came off to the ship but we had less trade on shore 439
than yesterday as most of the people went away when Poulaho
landed. 643

Some of the Indians stole three glasses belonging to the Astronomical Quadrant while Mr King was observing on the beach, but 648
they were soon recoverd by applying to Feenou who had been very 634
usefull to us before when things were stole both here and at Ha'paee.

SUNDAY 8th. The wind ENE and NE. Moderate breezes but at night 132
rather gentle. The weather fine. A moderate sea. Between eight and
nine in the morning we weigh'd and left Annamooka steering sbw 114
for the island Amsterdam. The islands to the SE of Annamooka which 133
we had on our left are first Mango'eeke, Mango, Tonoo'maia,
Ko'noogoo and Falla'fa'jeea.[1] There is also a very small one off 103
Kon'oogoo call'd Gefoo'ganna[2] from which runs a large shoal nam'd
Ko'foonga'lillo.[3] In the evening between five and six we saw two
islets or rocks bearing W about four leagues, the Noermost call'd
Hoonga ha'paee and the other Hoonga'tonga.[4] The first has only five 162

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[1] Kelefesia.

[2] Kefikana, a conspicuous white rock.

[3] I cannot identify this shoal.

[4] Hunga Ha'apai and Hunga Tonga.

55: Anderson D,T-5 (1777) 1967 OU9 Tonga OU9

[1777]

137 to any country that produces them. The Boogo which is the largest
tree of the country, and a species of fig with narrow pointed leaves
are the most conspicuous for their size,[1] and on the uncultivated
spots especially towards the sea the most common bushes and small
trees are the Pandanus, several sorts of Hibiscus, the Faitanoo
[764] already mentioned and a few others. It ought also to be observ'd that
though the materials for forming grand Landscapes are wanting,
[241] there are many of what might at least be calld neat prospects about
the cultivated grounds and dwelling places, but more especially about
the Fyatokkas or burying grounds, where sometimes art, sometimes
132 nature has done much to please the eye. From its situation towards
the tropic the climate is more variable than in countrys farther within
that line, though perhaps that might be owing to the season of the
year which was now the winter solstice. The winds are for the most
part from some point between S and E, and when moderate are
commonly attended with fine weather. When they blow fresher the
weather is often cloudy though open, and in such a case there is
frequently rain. It sometimes blows from that quarter for a fortnight
together and will then veer to the NE, NNE or even NNW, but never
lasts long nor blows strong from thence though it is commonly
accompanied by heavy rain and close sultry weather. Very hot
weather and lightning are almost sure presages of a change, and that
commonly to rain, but seldom to strong winds which indeed from
821 many circumstances are probably very rare here. The natives are
very sensible of the changeable weather and seem tolerable judges of
what will happen, so far at least that they manage their sea affairs
from such a knowledge, and are often glad at the approach of rain
(though it is immediately disagreeable to them) from the advantage
deriv'd to their Yams &c by it. The quick succession of Vegetables
has been already mentioned, but I am not certain if the changes by
which that is brought about are considerable enough to make them
perceptible to the natives as to their method of life, or rather that
132 they should be very sensible of the different seasons. The heat often
rais'd the Thermometer to   degrees while we stay'd and I
imagine when the sun is vertical it will not be above   degrees more,
so that if we consider the effect as produc'd gradually the difference
cannot be very great; though perhaps the most convincing proof of
this small change is the state of the vegetable creation which is never
so much affected by them with respect to the foliage as to shed that
all at once; for every leaf is succeeded by another as fast as it falls

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[1] The Puko, *Hernandia ovigera*, can grow as high as 65 feet; and the *Ficus obliqua* upwards of 100 feet.

184 height, and when broken off appears sometimes of a reddish though
oftener of a brownish yellow colour & pretty stiff consistence. Where
[137] the shore is low the soil is commonly sandy or rather composd of
[241] triturated coral, which however yields bushes with great luxuriance
and is sometimes planted not unsuccessfully by the natives.

Of cultivated fruits the principal are Plantanes of which they have
241 eighteen different sorts or varieties, Bread fruit, Jambos,[1] a sort of
245 plumb mention'd in Capt^{n} Cooks account of Otaheite call'd E'eevee,[2]
and vast numbers of Shaddocks[3] which however are found as
241 often in a natural state as planted. The roots are yams, of which are
two sorts, one black & so large that they often weigh twenty and
244 thirty pound,[4] the other white and long seldom weighing a pound;[5] a
large root call'd Kappe,[6] one not unlike our white Potatoes call'd
Ma'whaha,[7] the Talo or Coccos[8] of other places and another nam'd
241 Jeejee.[9] Besides vast numbers of Cocoa nut trees they have three other
sorts of palms two of which are very scarce. One of them is call'd
245 Beeoo, which grows almost as high as the Cocoa tree, has very large
leaves plaited like a fan, and clusters or bunches of globular nuts not
larger than a small pistol ball growing amongst the branches with a
very hard kernel which is sometimes ate.[10] The other is a kind of
Cabbage tree not distinguishable from the Cocoa but by being rather
thicker and having its leaves more ragged. It has a Cabbage three or
four feet long, at the top of which are the leaves and at the bottom the
fruit, which is scarcely two inches long, resembling an oblong cocoa
nut with an insipid tenacious kernel call'd by the natives Neeoo
[764] goola or red cocoa nut, as it assumes a reddish cast when ripe.[11] The
third sort is calld Ongo ongo and much commoner, being generally
found planted about their burying places. It seldom grows higher
than five feet though sometimes to eight, and has a vast number of
oval compress'd nuts as large as a pippin sticking immediately to the
137 trunk amongst the leaves which are not ate.[12] There is plenty of
excellent sugar Cane which is cultivated, Gourds, Bamboo, Tur-
114 meric, and a species of fig about the size of a small cherry calld Matte,
824 which though wild is sometimes ate;[13] but the Catalogue of unculti-
241 vated plants is too large to be ennumerated here, especially as the
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[1] *Eugenia malaccensis.*

[2] Vi, *Spondias dulcis.*

[3] *Citrus decumana.*

[4] *Dioscorea alata*, though the tubers are generally brown on the outside rather than black. They sometimes grow to an enormous size, 6 to 8 feet long, and weigh much more than 30 lb.

[5] ? *Dioscorea bulbifera*, the wild yam.

[6] The Giant Taro, *Alocasia macrorrhyza.*

[7] Mahoa'a, *Tacca leontopetaloides.*

[8] Taro, *Colocasia antiquorum.*

[9] Si, *Cordyline terminalis.*

[10] Piu, *Pritchardia pacifica.*

[11] It was a sort of coconut: Niu kula, *Cocos nucifera* ssp.

[12] It is called Longo-longo by the modern Tongans: *Cycas circinalis.*

[13] Modern Masi, *Ficus tinctoria.*

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unknown ones discoverd by D^r^ Forster who visited these islands in 1773 and 1774 are not yet wholly publish'd. Besides the Pemphis,[1] Decaspermum,[2] Mallococca,[3] Maba[4] & some other new Genera describ'd by that Gentleman in his Characteres Generum Plantarum, London 1776, there are a few more found here which the different perhaps season of the year and short stay did not suffer him to detect, although it did not appear during our stay that above a fourth part of the trees and other plants were in flower, a circumstance absolutely necessary to distinguish the various kinds by.

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[824]
[241]
[249]

The only Quadrupeds (besides hogs) are a few ratts,[5] and some dogs which are not natives of the place but produced from some left by Capt^n^ Cook in 1773, and others got from an island call'd Feejee, which must also have been lately, as the breed is not yet so numerous as to furnish the neighbouring isles with any. Fowls which are of a large breed are domesticated here.[6] Amongst the Birds are Parrots, somewhat smaller than the common grey ones, of an indifferent green on the back & wing, the tail blueish and the rest of a sooty or chocolate brown;[7] Parroquets not larger than a sparrow, of a fine yellowish green with bright azure on the crown of the head and the throat and belly red;[8] besides another sort as large as a dove, of a fine green with a blue crown & thighs, the throat & under part of the head crimson, as also part of the belly, and the rest a beautifull green.[9] There are owls about the size of our common sort but of finer plumage,[10] the Cuckoos mention'd at Palmerstons island,[11] King fishers about the size of a thrush of a greenish blue with a white ring about the neck;[12] and a bird of the thrush kind, almost as big, of a dull green colour with two yellow wattles at the base of the bill, which is the only singing one observ'd here but compensates a good deal for the want of others by the strength & melody of its notes which fill the woods at dawn, in the evening and at the breaking up of bad weather.[13] The other land birds are Rails as large as a pigeon of a variegated grey colour with a rusty neck,[14] a black sort with red eyes not larger than a lark,[15] large violet colour'd Coots with red bald crowns,[16] two

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[177]
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[1] Ngingie, *Pemphis acidula*.
[2] Nukonuko, *Decaspermum fruticosum*.
[3] Fo'ui, Forster's *Malococca crenata*, now *Grewia crenata*.
[4] Mapa, Forster's *Maba elliptica*, now *Diospyros ellipticifolia*.
[5] *Rattus exulans*.
[6] The common Indonesian and Pacific *Gallus bankiva*.
[7] Tongan Parrot, *Pyrrhulopsis tabuensis*.
[8] Blue-crested Parakeet, *Coriphilus fringillaceus*.
[9] *Coriphilus solitarius*.
[10] *Strix delicatula*.
[11] *Eudynamis taitensis*.
[12] White-collared Kingfisher, *Halcyon chloris*.
[13] Wattled Honey-eater, *Foulehaio carunculata*.
[14] Banded Rail, *Rallus philippensis*.
[15] Spotless Crake or Sooty Rail, *Porzana tabuensis*.
[16] Swamp Hen, *Porphyrio melanotus*

suffer'd to shoot into a trunk, and the coarser sort which they sleep 462
upon from a plant call'd E'varra.[1] There are many other articles of
less note that employ their spare time, as combs of which they make 285
vast numbers, little baskets made of the same substance as the matts [824]
and others of the fibrous Cocoa nut husk, either plain or interwoven [245]
with small beads, but all made with such neatness and taste in the [248]
disposition of the different varietys, which are very numerous, that a
stranger cannot help looking with pleasure at their assiduity and
dexterity. Every person knows the beautifull character that Solomon 462
has drawn of an industrious women and the happy consequences
that attend it, and we may almost venture to say that Solomon in
that character has included a true picture of all the women of Tonga.
The province alloted to the men is as might be expected far more
laborious and extensive than that of the women. Agriculture, Architecture, [241]
Boat building, Fishing and other things that relate to Navigation [341]
are the objects of their care. I would not wish to refer to any [396]
thing prior to the date of this voyage to illustrate any circumstance [226]
by, when I can avoid it, as it would be interweaving subjects that
ought to be seperate unless every person knew them as well as myself, [502]
but I cannot help relating here an observation which may have been 562
made before, though not to my knowledge, which is that in all the
places I have visited in these seas the degree of civilization that has 171
taken place amongst them may be known by the attention they pay
to the fair sex. Those in a very barbarous state treat their women
with such a degree of rudeness or rather brutality and at the same
time indifference that they seem to think them not so much intended
as a companion, or to be upon the same scale with themselves, as a
set of beings every way inferior to them and only fit for such mean
offices as they would not stoop to. On the contrary as civilization has
advanc'd we find them not only eas'd of those laborious employments
which their natural delicacy of frame requires, but treated
with that respect to which they are often more justly entitled than
their lordly masters, and have even a great sway in the management
of affairs. Cultivated roots and fruits being their principal support 241
requires their constant attention to Agriculture, which they pursue
very diligently and seem to have brought to as much perfection
almost as circumstances will admitt of. The land about Mooa though 241
so well planted is scarcely equal to that part of the island where Cap^{t}
Cook anchor'd in 1773, and from Mooa to the NE point which is all 311
the places we have seen it is tolerable, from whence one might suppose,
if the unseen parts are in the same proportion, that two thirds

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[1] *fala* was the word for sleeping-mat, not for a plant. The pandanus was called *fa*.

241 of the island is in the highest state of cultivation. The large extent of
[311] the Plantane fields was taken notice of already, and the same may be
said of the Yams, these two together being at least as ten to one to all
[412] the other articles. In planting both these it does not appear they turn
over the ground as we do, but in a field that has lain waste and is
coverd with grass they dig small holes for their reception, and afterwards root up the grass with a flat narrow wooden instrument call'd Hōōò,[1] which in this hot country is quickly depriv'd of its vegetating power and soon rotting becomes a good manure. They are planted in rows by a line such as our Gardiners use, in such a manner that which ever way you look the rows present themselves regular and compleat. The Plantanes are usually three paces asunder, the Yams two and the Jeejees one. The first are shoots from the root of the old tree, which when weak they often defend with a sort of basketing laid over them, and the Yam tendrils at first shooting up are frequently
245 supported on short bits of sticks. The Cocoa nuts and bread fruit trees
241 are scatterd about without any order and seem to give them no
trouble after they have attaind a certain heighth. The same may be said of another large tree which produces great numbers of a large roundish compress'd nut call'd 'Eēfee,[2] and a smaller tree that bears a rounded oval nut two inches long with two or three triangular kernels, tough and insipid, call'd Mabba,[3] most frequently planted near their houses. The Kappe is commonly regular[l]y planted and in pretty large spots, but the Ma'whaha is interspers'd amongst other things, as the Jeejee or Yams, the last of which I have frequently seen in the interspaces of the Plantane trees at their common distance.
241 Sugar cane is commonly in small spots crowded closely together, and
248 the Mulberry of which the cloth is made, though without order, has
sufficient room allowd it and is kept very clean. The only other plant
[249] they cultivate for their manufactures is the Pandanus which is
commonly planted in a row close together at the sides of the other fields, and they consider it is a thing so distinct in this state that they have a different name for it,[4] a proof that they are very sensible of the great changes brought about by cultivation. Whether the same remark may be applied to the Mulberry I am not certain, for it seems doutfull if ever they knew it in any other than its present cultivated one, as it never flowers; at least there was none of the old trees from whence they could propagate it seen, wheras the Pandanus is one of
417 the most common in the country. Their fences should be considerd
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[1] *huo*.

[2] Ifi, *Inocarpus edulis*.

[3] Mapa, *Diospyros lateriflora* or *D. ellipticifolia*.

[4] The Tongan vocabulary at the end of the third volume of the printed *Voyage* gives one of the meanings of 'Keeai' [*kie*] as 'the cultivated Pandanus'.

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439 the Hogs or breadfruit, & tho' it was a contraband Trade it was
prosecuted with the greatest Activity & Spirit in defiance of the
[648] severe Penalties with which it was loaded, & in Contempt of that
[565] Danger which attended the Prosecution of this fraudulent & lucrative
Traffick. This Article was no other than red Feathers. It must be
[171] remembered that at Otaheite red Feathers are prized above anything
whatsoever, they being the most valuable offering they make to their
Gods & very scarce at that Island as they have no birds with red
Plumage, this Circumstance was found out by our Circumnavigators
last Voyage, who happening to bring a few red feathers with them
from the Marqeses found what great Value the Otaheiteans set upon
them, preferring them to every thing they had got. This being
universally known in the two Ships it is no wonder that every one
endeavoured to supply himself with a good Stock at these Islands
where they are so plentiful, tho' these people get them from another
Island. The Indians in a short time perceving our eagerness after
them raised the Price of them, so that at last they became so dear
that it was hardly worth our while to purchase them, as the Hatchets
& Shirts we gave them would fetch as much at Otaheite as the small
Quantity of Feathers they gave us for them. However every one
provided himself with a good Stock before we left these Islands &
[292] they turned out to very good Account at Otaheite. The Inhabitants
[301] make Caps of them & various Ornaments for their Dresses, those
they sold us were pasted on Cloth, & had a very beautiful appearance.

Some of us used to go every day shooting wild Ducks, a great
122 number of which were met with on a large Lagoon & some Ponds in
609 the interior Part of the Island, the Indians would generally attend us
& look out for them & when they were shot run into the Pond &
241 fetch them out. Along the large lagoon which occupies a great part
of the middle of ye Island are most delightful walks shaded from the
361 Sun by the branches that meet together over head; the Country
262 throughout is exceedingly well cultivated & has the appearance of a
beautiful Garden; nothing can be more agreeable than the Inclosures
in which their Houses stand, round which the bread fruit & Plantain
Trees grow & extend their friendly Shade over the Natives, while
they sit beneath them partaking of a delicious & wholesome Meal
supplyed by those trees that spread their umbrageous Leaves to
133 defend them from the Rays of too near a Sun. Such enchanting
Prospects does this little Isle afford that it may be said to realize the
poetical Descriptions of the Elysian Fields in ancient Writers, it is
certainly as beautiful a Spot as Immagination can paint; there are
small Hills here & there to vary the prospect, tho' they rise to no

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nearly like that of Otaheite & they blow into it through the Nose, but 534
make very indifferent Music of it. The Mimia is made like the Pipe
of Pan with nine fistulæ tyed together of different Lengths, they draw
them along the Mouth & blow into them, but I never found that
they made any thing like music out of them. The Drums are made of
large cylindrical Pieces of wood like a Garden roller & excavated,
which must cost them much trouble to do with their Tools; a Slit
just wide enough to get the Hand in is made from one end to the
other & there is no hole at either end, they beat them with 2 Sticks.
Other musical Instrum^{ts} if such they may be called have been already
mentioned in the account of the Dances at Happai.

Their carving they execute very neat, this art is chiefly employed 532
by them in ornamenting their Clubs, which they carve all over with
the shape of Men, Birds, Dogs & Fish &c. in different parts, and fill
up the whole with strait & spiral Lines in various directions & they
sometimes inlay them with bone, as they likewise do their Stools that
they use for pillows tho' they never carve them, they also carve the
handles of fly flaps in the same Manner that they do their Clubs, &
they have small sticks carved two of which they put between their
fingers & clap together in the same manner that Children in England
do with Stones. They have small Images of Men & Birds made of [301]
Bone which they sometime[s] wear about their necks as ornaments. [321]
They polish their different Manufactures of wood with a file which [412]
is made of a piece of wood covered with the Skin of the Shark.

The general appearance of the Island is very beautiful it being [237]
entirely covered from one end to the other with Cocoa nut, Breadfruit
& other fruit trees, it is low, there being not a single Hill or any considerable 133
rising Ground upon it; it is long & narrow being about 137
in Length & broad. On advancing into the
interior part of the Country nothing can be more pleasing than the 344
appearance of their Houses and Plantations & of the Cocoa nut, [311]
breadfruit and Plantain Trees loaded with fruit & the large fields of [241]
Yams which are to be met with all over the Island, over which you
travel along delightful Lanes between the Wicker Partition of the [764]
different inclosures, & here & there is a burying place and a large
building much larger than the dwelling Houses, which seems appropriated
as a public Hall for the use of a district to meet in to
transact public Business or to perform their Dances, or as they were
situated near the burying places they perhaps perform some Ceremonies
in them at their Funerals. There were generally two or three
Seats hewn in the Pillars that supported the Building which seemed
to be for the reception of the Priests or Chiefs; in these Houses they

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344 kept their Drums. The soil is rich & good & the Climate equal & fine
134 like most others situated in the same Latitude, where there is no cold
Weather & the Inhabitants are not oppressed with Heat.

132 The Chief Produce of the Island is Cocoa nuts, bread fruit, Plantains
& yams & Sugar Cane, all which the Country affords in great
241 Abundance, & there are some Shaddocks, but not near so many as at
231 Middleburg. Their Hogs are not so large as those of Otaheite nor so
numerous, tho' we found plenty to supply the Ships while we staid
[136] among them, there are but few Dogs & many Rats on the Island and
[177] large Batts. They were very fond of our Cats some of which they
stole, for which 2 or 3 of them were flogged on board the Discovery
[685] more than once. They have Variety of Birds some of which they used
[648] to bring on Sticks to the Ship to sell, such as Pigeons & a beautiful
small green & red Parrot and they have plenty of Poultry about their
Houses.

The Inhabitants of these delightful Isles are a handsome fine Race
302 of People; the Men are rather above the common size, strong &
[141] exceedingly well made, of a dark copper Complexion with black
[142] Hair naturally, I say naturally because they daub it over with a
Paste made of coral Powder which changes the Colour of it in different
places into yellow, so that it is of a mixed Colour yellow & black,
and this no doubt is the yellow Hair which Dalrymple takes notice
of as having been seen by Quiros & other former Navigators to the
South Seas, & which he supposes to be natural & therefore concludes
that they are a different race of Men from the other South Sea
Islanders who had not this custom among them, and therefore produces
it as an Argument for the existence of [a] Southern Continent
[171] & that these were some of the natives. This practice is not confined to
these people but common among other Islands in these Seas. They
304 tattaw or mark their Loins & Thighs in various Lines according to
their fancy, tho' there is an uniformity or standard to which they all
approach like the Otaheiteans in tattawing the Breech. Some of
302 them tattaw the Glans Penis. They all shave their beards, which is
done with 2 small shells with sharp edges one laid under the Hair
[237] while they cut the beard with the other, & by this means they perform
the Operation with expedition & get the hair off tolerably
[412] clean, tho' they always preferred our Razors when they could prevail
upon the Ship's Barber to trim them.

Their Dress consists of a piece of Cloth tyed round the middle
291 which descends as low as the Knee with sometimes a matt over it;
others wear what they call a Pooraw[1] which is a Substance between

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[1] *pulou.*

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a small sized mean-looking People in comparison with the others & 142
the women in general are not so handsome. A few of them lay on
board the Ship every night. 609

The Island is high & of a very beautiful appearance; the Hilly part
is covered with Verdure & the skirts of the Island along the Sea 133
Shore covered with Cocoa nut, Breadfruit & other Trees; they have 137
many Shaddocks here; the Produce of it is the same as that of Tongataboo. 241
We got no water here.

THURSDAY JULY 17th. This forenoon we got under Sail with the 312
wind at SE and stood to the southward, at Sunset took our Departure
from Oohā bearing NE distant 2 or 3 Leagues, which was the last we 122
saw of the Friendly Isles. We are now shaping our Course for
Otaheite.

FRIDAY AUGUST 8th. Nothing remarkable happened on our Passage, 000
till to day when in Lat. 24 S we fell in with the South east Trade and about noon discovered an Island to the Northward of us; we ran towards it till Sunset when we hauled our Wind & stood off & on during the night.

SATURDAY AUGUST 9th. At day light bore away for the Land, at 7 o'Clock hauled round the SW Point and soon after brought to under the lee of the Island. Sounded & had ground at 30 fathoms fine sand at the distance of about half a mile from the Reef. Several Canoes came off to the Ships but would not venture on board, but kept shouting to us at a distance. Omai understood their Language very well and spoke to them but still they were afraid of trusting themselves on board, he asked them the Name of the Island & they told him it was called Oto-boo-ee[1]: As there was no prospect of a Harbour or of getting any thing here, at nine o'Clock Captn Cook made sail & steered again for Otaheite. This Island is between four and five miles in length, is surrounded by a reef at a good distance from the Shore, with Openings that seemed navigable for Ships, it is high uneven Land, it appeared on our first making it like two Islands, being low in the middle & high at each end; at a little distance from the East end lay three small Islands. Lat. 23°22′ S, Long 210°50′ E. The people seemed in their Persons like the Otaheiteans, their Canoes were quite different in Shape from those of Otaheite & were painted of various Colours.

AUGUST 12th. Early this Morning we saw Osnaburgh Island & soon after came in Sight of Otaheite to the great pleasure of every one on board. Omai sat all day on the forecastle viewing his Native Shores

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[1] Tubuai.

[pp. 1051-1300 not processed]

197 'peculiar way of speaking.' The language of Niuafo'ou, although it is
Tongan, has a dialect status which shows grammatical relationships with
Samoan. Unfortunately for the world of anthropological linguistics
this dialect has never been fully studied and it is in danger of dying
out, for the younger generation speaks the main dialect of Tongan and
535 only the remaining old people speak the Niuafo'ou dialect. The *tau*
178 *faka-Niua* is a dance local to Niuafo'ou, and it too is in danger of
being forgotten.

133 This chain of volcanic islands is relatively unimportant to Tonga
182 today, but it is these very islands that are important for an understanding of the ecology which supports the Tongan social system. The
main inhabited islands of the Tongan group are coral islands, which in
most Pacific areas would be associated with lack of fertile soil and
[134] often a subsistence level economy. In Tonga, however, the flat coral
islands have reaped the harvest of the close volcanic islands and the
resulting deep, rich volcanic soil has made it possible to develop an
economy of surplus to maintain Tonga's highly stratified social system.
[162] The population concentration is mainly on these low-lying islands to the
134 east of the volcanic chain. The largest of this group of limestone
133 islands, Tongatapu, is less than 270 feet high, but in many places has
241 a soil depth of ten feet. The soil is excellent and a very large
proportion of the islands are intensely cultivated. The main food
plants are yam, taro, sweet potato, banana, sugar cane, manioc,
[262] coconut, and breadfruit. In addition, fruit of the mango, orange,

[TEXT CONTINUED ON PAGE 16]

262 pineapple and papaya are eaten in season, and kava is widely grown. [241] [231] Pigs and chickens thrive and, along with fish and tinned corned beef, form the main protein in the Tongan diet.

131 Geographically and administratively the Tongan islands can be divided into three main groups (see map, Figure 2.2). Tongatapu and [133] 'Eua in the south have by far the largest land area. The central Ha'apai group consists of small coral limestone islands. Lifuka, largest of the Ha'apai group, is 4 1/4 miles long and 1 1/2 miles at its broadest place. The Vava'u group lies 60 miles northeast of [504] Ha'apai and consists of one large and several small islands. Neiafu harbor, Vava'u, is one of the best land-locked harbors in the South Pacific. In addition to these three main groups there are outlying islands to the north, including Niuafo'ou, Niuatoputapu, Tafahi, Toku, and Fonualei.

132 The temperature varies from the low 50°s to 90°, the humidity is usually very high, the mean being almost 80°. Annual rainfall is about 65 inches per year. There is usually a definite wet season from December to April and often a draught between October and December. [312] Until recently all fresh water was rainwater. Tonga is subject to [731] hurricanes and not infrequently thousands of coconut and banana trees, the basis of their cash economy, are ruined.

PEOPLE AND LANGUAGE

161 This is the geographical setting in which nearly 70,000 people play their daily social roles. The figures of the last Tongan census,

this will be an indication that the basic fabric of their culture and society has 121
shifted. 276
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NOTES

1. This is a revised version of a paper presented at the Third Annual Meeting of the 121
Association for Socail Anthropology in Oceania (March 13-17, 1974) for a
Symposium on "Alcohol and Kava Use in the Pacific Islands." Research was 186
conducted in Tonga from July to October of 1970 and from August to October of 524
1971. In the intervening months archival research was conducted in the major
libraries of Fiji, New Zealand, and Australia, with most of the research being done in 276
the Mitchell Library, Sydney, Australia. [101]
2. There is at least one other alcohol-dispensing club in the Kingdom, namely the
"Vava'u Club" in Vava'u. Since my work in Tonga a new hotel has opened in Vava'u, [127]
and alcohol prices probably follow the prices of the hotels on Tongatapu. It should
be pointed out that in 1970 and 1971 the various clubs and hotels were selling 275
beverages in obvious violation of Tonga's "Blue Laws" which (theoretically) forbid 273
essentially all non-religious business activities on Sundays.
3. For further information on rank and title see Urbanowicz 1973 114. 795
4. Tongans not only presented *kava* roots to important individuals but also took *kava* [527]
roots on visits to important places. The Wesleyan Missionary W. Cross, in the islands
from 1827 to 1833 and again from 1834 to 1835, pointed this out: "The [Tongan] [656]
Chief observed that on former occasions when they visited and [*sic.*] island it was
their custom to take large pieces of *kava* for the gods; and that to Nomuka alone they 276
used to take at least 10 pieces" (Cross 1830b). 574
5. A similar detailed description from Hobbs supports the idea of title removal and land
distribution at a kava ceremony: "A 'fai Kava' i.e. meeting for drinking Kava took 554
place at Nuku'alofa on Tuesday the 18th at which [Jiosaia] Tubou presided of 113
course as the Tui-kanokubolu. Taufa-ahou [also known as King George Tupou] and
all the other principal persons were there, and word was sent to Lavaka at the Bea to 276
come and attend before our people and Taufa-ahou left the Island, but Lavaka [still]
refused. The ceremony therefore proceeded without Lavaka. THE PRINCIPAL 574
OBJECT OF THE KAVA MEETING WAS TO STATE OFFICIALLY FROM THE 609
TUI-KANOKUBOLU WHO WAS THE[N] [TO] OCCUPY THE GOVERNMENT IN
THE DIFFERENT DISTRICTS IN TONGA since the rebellion; and the principal
things affected by this appointment are as follows: Old Fatu who was the 1st heathen 425
[or non-Wesleyan] chief who submitted, and who had now come to Nukualofa to the 276
Tui-kanokubolu has got a considerable augmentation of his power in being appointed
Tui-Hahake. OLD LAVAKA IS OFFICIALLY DEPRIVED OF ALL HIS POWER BY 574
THE APPOINTMENT OF OLD SEMI AND FOKE as Tuihaamea, because the fortress 684
at the Bea stands in Haamea" [all STRESS added] (Hobbs *Journal*: April 22, 1837).
6. I witnessed a *Taumafa kava* ceremony on the island of 'Eua over the period 558
14 September to 17 September, 1971, having travelled to the island with the royal
part on *H.M.Y. Kao.* Enroute to 'Eua from the island of Tongatapu, a journey of 651
some four hours, I was fortunate to have approximately a three hour and forty-five 178
minute private discussion with His Majesty King Taufa'ahau Tupou IV (on just about
everything under the Tongan sun, including *kava*). Much of my thinking about *kava* 543
has been influenced by my discussions with His Majesty AS WELL AS by numerous 643
discussions with other Tongans, of all ranks. I also took part in numerous kava 123
ceremonies in Tonga occasionally where I was treated as the guest of honor.
7. The *'inasi* ceremony was not only an important ceremony in aboriginal Tongan 115
society but it also had parallels in other parts of Polynesia (Goldman 1970 134; and 276
Sahlins 1958 24-25). The Tongans were a horticultural people and indeed, today, 574
agriculture along with "tourism" are the mainstays of the Tongan economy. The yam

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or *'ufi* was the main crop and W. Cross wrote "the yam is a vegetable that is to the
651 inhabitants of Tonga, what bread is to many in our native land" (Cross 1830a). The
649 aboriginal Tongan names of the respective parts of the year were based on the lunar
month and thirteen separately designated time periods (Dyson *Papers 1858-1908*:
776 April 7, 1863). These names clearly show the importance of the yam to the Tongans
782 and Thomas wrote that the month of June was termed "Hilinga kelekele" by the
Tongans and that "they expect the soil to produce forth now" and of the yams at
● 241 this time of the year that they are "the earliest and the best yams." For the month of
805 October, Thomas wrote "Ooloo enga – Uluega" which is *'Ulenga* for "ooloo, the
head, enga yellow" and at this time the yams "became yellow" (Thomas 1827: no
page).

643 8. This same aspect of a "dual installation" also took place when His Majesty's mother,
Queen Salote Tupou III, was installed as Queen in 1918 (after the death of her father,
276 King George Tupou II). As Collocott pointed out: "a coronation ceremony in the
574 European model was followed by a native installation with appropriate kava
ceremony on the mala'e at Nuku'alofa" (1927:38).
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67: Maude K-5 (1961) 1973 OU9 Tonga OU9

7 Land shortage and population pressure in Tonga

Alaric Maude

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121 The problems of land shortage and population pressure in small
islands with only limited resources have been recurrent themes in
recent geographical research in the Pacific islands, particularly in
island Polynesia where populations are now generally increasing at
rates of between 3 and 3·5 per cent annually. This essay is concerned
with the chain of islands in western Polynesia which form the
131 Kingdom of Tonga (Fig. 7.1). The 150 islands of the Kingdom,
comprising the three main groups of Tongatapu, Ha'apai and
161 Vava'u, and a number of outlying islands, have a total land area of
only 663km^2 and support a population of about 87,000 (1970 esti-
433 mate). The Kingdom's only natural resources are the soil and the
surrounding reefs and seas, and the economy is overwhelmingly
241 agricultural, being based largely on subsistence food cropping and
the export of bananas, copra and desiccated coconut. With a limited
161 area of land, a population density in 1970 of about 185/km^2 of arable
182 land, and a projected annual population growth rate of 3·1 per cent,
Tonga faces potential problems of land shortage and population
pressure as severe as in any other nation or territory in the Pacific
Islands, with the exception of some of the atoll groups.

121 The focus of this essay is on man/land relationships, for with an essentially agricultural economy these are central to Tonga's population problem. The main objective is a search for, and examination of, possible symptoms of population pressure within the man/environment system. Particular attention is paid to land tenure, which determines how land is allocated amongst the population; the agricultural system, agriculture being by far the most important use of land; and the perception of, and reponse to, population pressure by Tongans. At a more theoretical level, the final part of the essay

423 and the 1966 Census enumerated 20,003 males aged 16 and over.
161 A second reason is the uneven distribution of population discussed in the previous section. In areas where population densities are about
162 180/km^2 and over (i.e. 0·56ha or less, per person, of all land), most holdings have for many years been less than 3ha; when cadastral surveys were first carried out in these areas the population density was already such that holdings were generally about 1 to 2·5ha, and any attempt to stick to the statutory size of allotments would have
423 led to the dispossession of many landholders. Despite the small size of the holdings there are still many more men entitled to land than there are allotments, and the typical pattern of land distribution in these areas is shown in the figures for Ha'afeva and 'Uiha (Ha'apai) and Ha'avakatolo (Tongatapu) in Table 7.2. In Ha'afeva the high level of landlessness is partly a result of the fact that nearly half the persons who held land on the island in 1966 lived elsewhere in Tonga, and this phenomenon of a large number of absentee landholders is common to many islands in Ha'apai. In areas of moderate population density (around 100 to 150/km^2) the pattern of land distribution is as shown in the date for Ha'akame, Nukunuku and Ha'ateiho in central Tongatapu. On these estates almost all allotments are of 3·2ha and consequently a larger proportion of taxpayers and households are generally without land than is the case in villages with higher population densities. Where population density falls to about 80/km^2 or less the pattern of land distribution is represented by the figures for Niutoua in eastern Tongatapu, where in 1962 only 3 per cent of the households had no land. Landlessness on this Government estate would have been even less had it not been for the fact that one-third of the registered allotments on the estate were held by people who lived in other settlements, mostly either in nearby villages or in Nuku'alofa, a not uncommon feature of Government estates in eastern Tongatapu.

These data on the percentage of households are by themselves of only limited value in an assessment of population pressure. The fact that a man does not hold land, or has only a small allotment, does not necessarily mean that he does not have satisfactory access to
423 land for food production and cash cropping. The borrowing of land
427 from relatives, friends, villagers and estate-holders is common throughout Tonga, and has its basis in the customary, although now
178 weakened, obligations that exist between kinsmen, friends and a
[241] chief and his people. It is fairly easy to borrow land for growing

423 short-term subsistence crops, even in densely populated areas, and
427 although many villagers claim that it has become more difficult in
[178] recent years it is hard, if not impossible, to find a rural family short of
food simply because they cannot borrow enough land for gardening.
[241] When land is borrowed from a relative no direct payment is usually
made, but in borrowing from others it is customary to give a small
[687] part of the crop to the landholder. Although it is illegal, there appear
[178]

592 **Table 7.3** **Cash-crop income and area of land held by household, Tongatapu, 1961**
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	Land held by household No land	 1 allotment (2·7–3·8 ha)	 2 allotments (6·3–7·4 ha)
Number of households	31	59	17
Mean cash-crop income ($A)			
per capita	18·4	36·4	36·4
per adult male (aged 16 and over)	69·8	157·6	152·8

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687 to be a growing number of cases in which a cash payment is made
for the use of land.
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Obtaining the use of land for cash cropping is more difficult. The
423 demand for such land has increased with the growth of the popula-
178 tion and the greater commercialization of Tongan agriculture, while
241 in Tongatapu, where the demand is greatest, the amount of spare
land has decreased markedly in the last decade as a result of the allocation of allotments in the eastern half of the island, and an increase in banana planting by landholders in response to the improved market in New Zealand. Furthermore, the customary obligation to assist relatives and others, evolved in a society with a subsistence economy, applies less strongly to the rather different
423 conditions of commercial agriculture. Men borrowing land are
increasingly having to pay a cash rental. While some of the large-
427 scale banana growers, and market gardeners who can afford to pay
241 such rents and to contribute food crops and pigs to the landholder
178 or estate-holder, still have little difficulty, the ordinary landless

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427 villager finds land borrowing for cash production an increasing
178 problem. Land cannot be borrowed for planting coconuts, which
rank about equal with bananas as a cash crop, and palms on an
241 allotment are the property of the landholder, regardless of who
423 planted them. A common practice for those without land is to obtain
245 permission to collect one or two cartloads of coconuts for copra-
427 making from the allotment of a relative or close friend, and for this
no return is given. Another arrangement found, especially between non-relatives and where the landholder is absent, is for the cash received for the copra to be shared half-and-half.

423 The effect of landholding on cash-crop incomes is shown in
511 Table 7.3, which presents data from the household survey of four
592 Tongatapu villages mentioned in an earlier section. The inability of
the social system and its customary obligations to even out inequalities in landholding is shown in the fact that households without land had only half the income per capita or per adult male of households with a full-sized allotment. On the other hand households with two allotments did not have higher incomes per head than single-allotment households, for although total income was higher these households were larger and had more adult males.*

423 The main conclusion that can be drawn from this discussion is
182 that the present land-tenure system, although it cannot provide land
178 for every household, is still able to cope with the subsistence needs
241 of the people, but is less able to cope with the rising demand for land
for cash cropping. The increasing difficulty of borrowing land for growing cash crops and the trend towards the payment of rentals for land both point to pressure within the system. This pressure, however, is as much the result of the growing commercialization of Tongan agriculture as of population increase alone.

THE AGRICULTURAL SYSTEM

241 Tongan agriculture is based on a bush fallowing system† for the cultivation of tubers, the main food crops being yams, taro, cassava, sweet potato, bananas and plantains. After clearing and burning, a plot is cropped for two to about five years and then bush fallowed for

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[128] * The number of households in the survey with allotments smaller than 2·7 ha was too few for useful analysis.

† The term 'bush fallowing' is here used to describe a form of shifting cultivation in which the fallow period is short.

from one to ten or more years, depending on population density. 241 Of the two main cash crops bananas are often incorporated into this 241 bush fallow system, being planted as part of the cropping sequence 245 and yielding for only a couple of years before the land returns to bush; but during the last few years they have increasingly been grown in separate plantations, and chemical fertilizers are now being used both to improve yields and to extend the life of the plot. The other main cash crop, coconuts, is unevenly scattered over all or part of each allotment, with the food-crop gardens being rotated amongst them. The effect of population density on this system will 121 be examined from two perspectives, the ecological and the economic.

An ecological assessment

In Ha'apai, where the agricultural system is under the greatest 241 pressure from high population density, the cropping period is now 182 usually from three to five years, compared with the two or three years common elsewhere, while the fallow period is generally from only one to three or four years compared with three to five years elsewhere. Many farmers in Ha'apai are using shorter fallows than when they began farming, a common change reported amongst older men being a reduction to half the earlier fallow length. The food-crop pattern has also changed with the increase in population density. In areas of high density, cassava has become the staple food crop [244] while yams, the most preferred tuber for eating, are now much less frequently grown. Cassava gives good yields even on heavily-cropped soils and does not require a lengthy fallow, and also yields more per man-hour of labour than the other food crops.

The response of Tongan farmers to population growth has therefore been to reduce fallow periods, lengthen cropping periods and alter the food-crop pattern, and these changes are most pronounced in Ha'apai. There the agricultural system is now fairly intensive by [161] the standards of shifting cultivation, with a cropping period/fallow period ratio of around 1 : 1, and supports population densities of up to about 280/km^2 (cf. Nye and Greenland, 1960, 128). Yet despite the probable doubling in the intensity of cropping over the last 30 to 40 years there has been no change in the bush fallow technique of maintaining soil fertility, and one might therefore expect to find symptoms of ecological stress within the system.

An examination of possible areas of stress, however, suggests the existence of as yet only minor problems. There has been some [137]

241 deterioration in the fallow vegetation, with an increase in the pro-
182 portion of grasses and other herbaceous plants and the spread of
137 lantana (*Lantana camara*) and guava (*Psidium guajava*), and weeds
have become much more of a problem for farmers than in the past.
241 It is also widely believed that soil fertility in Ha'apai has declined
134 over the last few decades. This belief is partially supported by the
182 results of chemical analyses of Tongan soils. Ha'apai soils should be
very similar in composition to those of Tongatapu, as parent materials, relief and climate are much the same throughout the two groups, but analysis of a number of soil samples suggests that they have much lower levels of available potassium. Chemical analysis by itself, however, is not a completely reliable guide, and there have been no yield measurements or fertilizer trials which could provide further evidence on soil differences. The comments of farmers, on the other hand, indicate that there has certainly been no serious decline in soil fertility, for satisfactory yields are still obtained despite the intensity of the agricultural system.*

An economic assessment

182 Assessment of the effect of high population density on the level of
511 living supported by the agricultural system is more difficult, because
the level of living is influenced by a large number of variables apart from population density, and data that might be useful in such an assessment are limited. As far as food production is concerned there is no evidence to suggest that people in rural areas of high population density have a diet poorer in quantity or quality than that found elsewhere in Tonga; the worst nutritional problems are in fact in the
[241] towns. Production per head appears to have been maintained by
the increased frequency of cropping and the change to higher-yield
[146] tubers, and any deficiencies which might result from a high con-
[433] sumption of protein-poor cassava are probably balanced by a high
consumption of seafoods. Measurement of food gardens in three villages in Ha'apai and Tongatapu showed no relationship between population density and per capita garden area.

[433] Analysis of the *per capita* levels of production of copra and bananas,

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* For a fuller discussion see Maude (1970). The only effect of intense cultivation on Tongatapu soils noted by H. S. Gibbs in a paper presented to the 1971 Pacific Science Congress is a possible increase in iron nodules in areas of frequent clean cultivation. Such a change, if present, would tend to lower soil productivity by decreasing the friability of the soil.

433 The above evidence points tentatively to mild symptoms of
182 economic stress in areas of high population density. Land appears to
have become a limiting factor in production given the present level
of agricultural technology, but at population densities which vary
according to the crop; the population density at which *per capita*
banana production begins to decline, for instance, is higher than
that at which *per capita* copra production is affected, because bananas
[128] are a less land-extensive crop. Much more research, including
studies of nutrition, is needed before firm conclusions can be drawn.

POPULATION PRESSURE: PERCEPTION AND RESPONSE

121 To what extent are the pressures described in the last two sections
consciously felt by Tongans living in areas of high population
121 density? An attempt was made during field-work in western
Tongatapu, Ha'apai and eastern Vava'u to ascertain the degree to
124 which people felt hardship as a result of the shortage of land,
concentrating in particular on married men without allotments as
182 these were likely to suffer the most. We recall that even in densely-
settled areas most men without allotments found it fairly easy to
511 borrow land for cash cropping or collecting coconuts for copra-making.
Yet only a small proportion of the men interviewed seemed
to feel any hardship, all of these being men with large families to
support, and most considered their income sufficient for their
[124] essential needs. About 30 men were asked what they would do with
$A 1,000 if it were given to them; only one replied that he would
spend it on food and other necessities, the rest stating housing or
education for their children.

121 However, the degree to which population pressure is felt is better
determined by what men do than by what they say. There are a
182 number of possible reactions to population pressure, but only one of
166 these, migration, is really significant in Tonga. In land tenure, for
182 instance, there has as yet been no trend towards subdivision of
allotments, even though this is not prohibited should the legal heir
423 to the land be willing, and land disputes are rare. The only response
by those in control of land matters, the Government and the chiefs,
to the problems brought by population growth has been a belated
182 effort to complete the survey and allocation of allotments. In agri-
241 culture there has been a steady intensification of the system and a

shift in food crops, but the use of fertilizers, which represents a basic 182 innovation in the system, is largely confined to cash cropping in 241 Tongatapu and has not been adopted by farmers in more intensively cultivated Ha'apai. Very few farmers see any need to change their traditional techniques.

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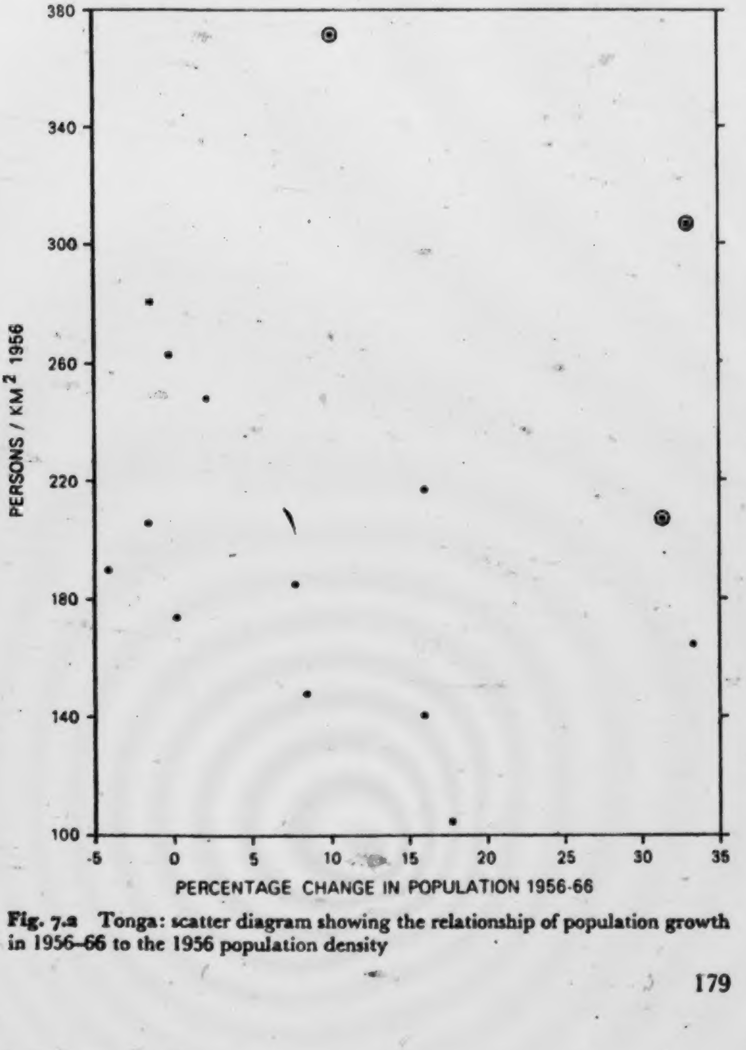

Fig. 7.a Tonga: scatter diagram showing the relationship of population growth in 1956–66 to the 1956 population density

to the presence of mild population pressure, particularly in Ha'apai. 121
These problems, however, are as much a result of the failure to 182
adapt the man/land system to cope with rising population densities as of population growth alone. Improvements are possible in land tenure, for instance to ensure that land is only allocated to those who can make good use of it, and in agriculture, through the adoption of new techniques in both food and cash cropping; while changes in the market for cash crops and in the availability and location of non-agricultural employment would also produce changes in the degree of population pressure in Tonga.

To what extent can the material discussed in this case study of 121
Tonga be used in an assessment of the ideas of Boserup and Geertz, both of whom have been concerned with the effect of population growth on traditional agricultural systems? Boserup (1965) argues that the intensification of agriculture, because it involves more labour-intensive techniques and a decrease in mean output per man-hour, only occurs when forced by population pressure. Geertz (1963), on the other hand, in his study of Indonesian economic history, draws a distinction between *sawah* agriculture, a stable system in which increases in population can be easily absorbed by intensification without harm to the environment, and shifting cultivation, a potentially unstable system highly susceptible to ecological breakdown if intensified in response to population growth. For Boserup agricultural systems of varying intensity from forest-fallow cultivation to multi-cropping lie along the one continuum, while for Geertz shifting cultivation and *sawah* agriculture are unrelated systems with different responses to population pressure.

Taking Geertz's contribution first, it is evident that while there 121
are some signs of mild pressure in Tongan agriculture there is no 241
indication of an impending ecological crisis, despite the doubling in 182
the intensity of cropping over the last 30 to 40 years, and the Tongan 171
system appears much better able to withstand population growth and intensification than the shifting cultivation model described by Geertz. For this there are several possible explanations. Firstly, there are some differences between the Tongan system and the south-east Asian examples on which Geertz's model is based. In south-east Asia the staple crop is rice, whereas the Tongan system is based on tubers, which may help to maintain soil fertility during cropping by providing a better cover for the soil surface, even though the patterns of inter-cropping and crop succession in Tonga are very simple. In

121 In addition, the agricultural environment in Tonga is much more
241 favourable for intensive cropping than are the environments in which
182 shifting cultivation is carried on in south-east Asia, for the soils,
171 derived from recent volcanic materials and not subject to heavy
[134] leaching, are of high inherent fertility. Although no yield measurements have been made, the decline in yields between the first and second cropping of a plot is certainly nowhere near the 80 per cent
121 drop reported by Geertz (1963, 23) from south Sumatra. Geertz's characterization of shifting cultivation applies to only one type amongst many, and to only one environment amongst the many in which this agricultural system is carried on.

[114] Following from this, I feel that Geertz, perhaps because he has confined his examples to south-east Asia, overestimates the fragility of shifting cultivation and the narrowness of the demographic limits within which it is a stable system. Nye and Greenland (1960, 129), for example, demonstrate that it is possible to crop at varying levels of intensity, and consequently of soil fertility, without catastrophic consequences to the soil. Up to a limit, which varies with the type of shifting cultivation and the environment, decreases in yield as a result of an increase in the intensity of cropping may be more than offset by increases in overall production because of the longer period
121 of cropping. This limit has certainly not been reached in Tonga,
241 where the agricultural system has a greater degree of flexibility in
response to population growth than Geertz admits for shifting culti-
182 vation systems.

On *prima facie* evidence, Ester Boserup's thesis more closely fits the Tongan situation, and her contention that differences in agricultural intensity are the consequence of differences in population density is supported by the material discussed earlier. However, the intensification of Tongan agriculture in response to population growth has not stimulated any basic improvements in the bush fallow technique of maintaining soil fertility except amongst strongly-commercialized farmers. It is important to an assessment of Boserup's thesis that this lack of change be explained; and two types of explanation are possible.

The first involves a consideration of the conditions under which population growth may fail to stimulate technological advance. Boserup does not claim that intensification will always lead to the adoption of new methods, and suggests several situations where failure is possible, some of which could apply to Tonga at present.

121 Firstly, under conditions of rapid population growth the rate at
182 which the intensity of cropping increases may well be higher than
241 the rate at which farmers are able to change their traditional
methods and their accustomed habits of work. The examples drawn
[171] on by Boserup to support her thesis are of populations undergoing slower rates of growth than have been recently experienced in Tonga, or in many of the developing countries, and this somewhat reduces the value of her thesis under contemporary conditions. However, observation and questioning in Tonga do not suggest the rate of population growth to be a major reason for the failure to adopt new methods of soil fertility maintenance. Secondly, failure is possible where farmers have no knowledge of the techniques which could be
121 adopted. In Tonga the only new technique known to farmers is the
182 use of chemical fertilizers, which because of their cost have so far
241 been used only with cash crops, whereas many African and Asian
shifting cultivators have had a knowledge of other methods or
171 contact with peoples practising more advanced systems of traditional agriculture.*

121 A third possible situation in which population pressure may fail
182 to produce corresponding technological advances in agriculture is
241 where institutional problems reduce the farmer's incentive, or ability,
[171] to undertake improvements. Boserup, for example, in a discussion of investment under landlord tenure, argues that the disorganization of the feudal land-tenure system of India during the colonial period, by slowing down investment in land improvement, especially irrigation facilities, helped to prevent agricultural output from responding
121 to population growth. In Tonga the customs relating to land could
182 produce a similar result. While land is individually held and the security of tenure good, land borrowing, sanctioned by custom, is
241 widespread and requests for land are not necessarily made only to
423 those who have it to spare. Consequently farmers do not have full control over the use of their land, and although field work indicates that this is not yet a reason for the failure to adopt new methods, farmers may in the future be reluctant to make an investment in improved techniques if the benefit of their investment may be gained by someone else.†

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* In both these cases the failure to adopt new techniques could lead to the ecological collapse described by Geertz, particularly in drier environments where regeneration of the fallow vegetation is more difficult.

† See also the comments of Waddell (this volume) on the relation of investment in improvements to tenacity of land tenure.

121 While the second of the three situations outlined above is a
182 possible explanation of the failure to improve agricultural techniques
241 in Tonga, another type of explanation—that such improvements are
not yet necessary—seems most likely to be correct. As suggested
182 earlier, the soils are of high inherent fertility, and shifting cultivation
241 systems can withstand a good deal of intensification before fundamental
changes are essential. The adoption of cassava and dryland
[407] varieties of taro, both of which were introduced into Tonga in the
nineteenth century, has helped to maintain yields per man-hour as
cropping has been intensified, while the adoption of the metal push-hoe
has enabled farmers to cope with the changes in the fallow
vegetation. Such adaptations in the agricultural system may well be
sufficient at the present level of intensity. The symptoms of population
pressure are still mild, and the main pressures felt by Tongans,
to judge from the material on land problems and migration, are in
[114] cash cropping rather than in the food-cropping system. Acceptance
of this explanation would thus leave Boserup's thesis in the category
[121] of 'not proven', but probable.

However, the fact that the most significant changes in Tongan agriculture, involving such practices as machine preparation of land and the use of chemical fertilizers, have occurred in Tongatapu amongst farmers heavily engaged in cash cropping rather than amongst the less commercialized farmers in more densely-populated Ha'apai, suggests one major qualification to her argument. While land shortage has undoubtedly been a factor in these changes, for they began about the time when land ceased to be easily obtainable in Tongatapu, they indicate that commercialization is also a stimulus to the adoption of improved techniques. Population pressure, as noted above, is felt mostly in cash cropping rather than in food cropping. The income received from cash cropping makes it feasible to purchase industrial inputs such as fertilizers, while changes in cash cropping have repercussions throughout the agricultural system.
182 The increase in the area planted in cash crops, for instance, intensifies
241 the pressure on the bush fallow system, but where food crops are
intercultivated with a cash crop like bananas, as is frequently the
245 case, the former benefit from the fertilizer used for the latter, thus
making it possible to lengthen the cropping period and reduce the
role of the bush fallow. With coconuts, a long-term crop, the need
to control bush growth conflicts with the traditional practice of bush
fallowing, and the achievement of higher productivity in coconut

plantations will thus require changes in food cropping techniques. 182
At present, therefore, commercialization and population pressure 241
would appear to be working together to stimulate agricultural [245]
improvements in Tonga, and where one or the other is weak the
extent of agricultural advancement is so far limited.

[453 cont.]

175 that if we suppose a gradual diminution of the sea, at the rate
133 which they pretend to have observed in Sweden (14), the emersion of
this island must be of so modern date, that it is matter of astonishment how it came to be covered with soil, herbage, and forests; so well stocked with inhabitants, and so regularly adorned as we really
175 found it. We picked up a quantity of shells at the foot of the steep
126 rock, where we sometimes waded in water to the knees upon a reef, on
175 account of the flood tide which was advancing. We likewise met with
439 several natives returning from the trading-place, who sold us a
[286] number of fish-hooks and ornaments, a fish-net made like our casting-
nets, knit of very firm though slender threads, some [454] mats and
[292] pieces of cloth. We likewise purchased of them an apron, consisting
[531] of many wheels or stars of plaited coco-nut fibres, about three or
[286] four inches in diameter, cohering together by the projecting points,
and ornamented with small red feathers and beads cut out of shells.
175 Finding that the water encreased too fast upon us, we looked out
123 for an ascent to the top of the rock, and having with some difficulty
● 241 found one, we re-entered the plantations, where we observed the weeds
175 rooted out with great care and laid in heaps to dry. After a long
123 walk, during which we missed our way, and engaged one of the natives
to become our guide, we entered a long narrow lane between two fences, which led us directly to the *Fayetooca* or burying-place we had left before. Here we found captains Cook and Furneaux, and Mr. Hodges,
[565] with a great number of natives, seated on the fine lawn. They were
in conversation with an old blear-eyed man, who had a good deal of weight among the rest of the people, and was always accompanied

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14. See the Memoirs of the Swedish Academy of Sciences at Stockholm.

[172 cont.]

609 obliged to return to the shore, very much discontented. Immediately
175 after breakfast, Dr. Sparrman, my father and myself accompanied
439 175 captain Cook to the shore, where a trade commenced for shaddocks and
yams, which the natives sold us in prodigious quantities. Bananas
and coco-nuts were scarce in proportion, and bread-fruit still more
291 rare, though the trees of these sorts were very numerous. All the
175 men went nearly naked, a slight covering on the loins excepted; a few
of them, however, and most of the women, were drest from the waist to
the ankles, in a piece of stiff painted cloth made of bark, wrapped
several times round them, or in mats.

As soon as our boats reached the shore, the clamours of all those
439 175 who had something to sell became so excessively loud, that we hastened
137 into the country, whose aspect was very inviting. A considerable
241 variety of plants covered the [173] ground in wild luxuriance; and the
175 great number of plantations of all sorts, made the whole island resemble
487 a beautiful garden. The fences which had confined the view at Tonga-
175 Tabboo, were here much less frequent, and only enclosed one side of
[417] the path, leaving the other open to the eye. The ground was not
487 137 perfectly level in the interior parts, but rose in several little
241 hillocks lined with hedges and bushes, which formed a most agreeable
175 prospect. The path which we met with, sometimes went under long rows
of lofty trees, planted at considerable distances, between which the
ground was covered with the richest verdure; sometimes a thick and
impenetrable arbour of fragrant shubberies vaulted over it for a
considerable space, and hid it entirely from the sun; sometimes
342 plantations, and sometimes wilds appeared on both sides. The houses
175 of the natives were of a singular structure; their height was about

245 rhinocerous beetle has damaged a large percentage of trees. The banana
crop has recently been infected with a fungus, black leaf streak dis-
ease, to such a degree that many of the growers have stopped planting
commercial crops, and in the remaining plantations the yield is insuffi-
cient to allow profitable harvest. Damage done by careless packing and
[439] improper storage during shipment is resulting in the dissatisfaction of
importers.

241 The 1966 Census of Tonga shows that 66.6 percent of all adult males
[162] were engaged in agriculture (Fiefia 1968: 28). Table 3 gives a full
[463] breakdown of occupation of Tongan males.[A] Agricultural techniques are a
[177] mixture of the traditional techniques-swidden agriculture, bush fallow
[178] periods, and hand tools-and modern methods including the use of ferti-
lizers, light machinery and single crop planting. The older techniques
241 are still the more widely used. A friable, well-drained, and easily-
134 worked soil is the predominant type. Maude (1965: 12-18) gives a fairly
detailed discussion of Tongan soils, their fertility, and their geolo-
gic origins.

241 Tongan agriculture is subsistence oriented and cash-cropping re-
[656] mains a secondary consideration for most Tongans, with the exception
that law requires the planting and maintenance of a certain number of
464 coconut palms. Wage labor provides income for only a few (Table 3) and
465 wages are low, averaging somewhere between $T1.00 to $T1.75 a day; most
wage labor positions are in the area of services.[1] [B]

A. [See p. 19--Analyst] B. [Footnote appears on p. 122--Analyst]

The Village and the Research Scene

101 The village selected for research is on the main island of the
103 Tonga group, Tonatapu. Its name is Puke (pronounced Pookay, please).
[361] Gifford (1926: 196) in his catalogue of Tongan place names enters Puke
as the gloss of fortress.[A] However, the term has several seemingly unrelated definitions in the Tongan language; the villagers thought the
name referred to a small hill in the village as the term denotes the
small hill above a planted yam. The village is located about 3 miles
[361] [131] west of Nuku'alofa; it is 1/4 mile from the main road going west from
Nuku'alofa and about twice that distance from the lagoon to the north
(See Map 2).

133 The terrain of the village and surrounding lands is flat and low-lying.
361 Village boundaries are easily distinguishable as fallow, and
● [241] producing garden plots stop abruptly at the perimeters of the village
compound. For some purposes the village and its population are divided
into three geographically defined sections. The sections are the eastern section (*vahe hahake*), the central section (*vahe loto*), and the western section (*vahe hihifo*); the sections are under the leadership of the
noble, the church steward, and the town officer, respectively.

361 Within the village are small patches of low-lying bush and many
245 trees have been left standing or planted; most prominent among the latter are the coconut palm (*niu*), breadfruit (*mei*), mangoe (*mango*), and
[824] tje *tava* amd '*ifi* trees. Many of the plants and trees growing within
[262] the village have uses as food, medicine, or decoration.

[278] A.[What Gifford actually says is "the outworks of a fortress". See 4: Gifford, this file p.196--Analyst]

CHAPTER V

VILLAGE ECONOMICS AND MODES OF EXCHANGE

433 181 178 Village economy in present-day Tonga is a composite of traditional forms of production, consumption, and exchange and Western modes of economic integration. The change from the traditional to the modern has proceeded slowly in an atmospere of conservatism and pride in maintaining the traditional life style. Traditional attitudes and values tend to force disbursement of acquired cash into areas which bring about social prestige rather than capital formation. 128 In this chapter I would like to describe village economy as it exists under this situation of change. I also will describe and discuss the various types of exchange utilized.

Cash Income

● 241 [434] The village economy is subsistence oriented and relies upon labor-intensive, swidden agriculture as the production base. All household heads rely to some extent on cultivation for meeting basic dietary requirements and usually combine with gardening some other subsistence pursuit to provide variation in their diet and to provide cash for other needs. 463 Table 11 gives the dominant occupation for forty-two household heads in Puke. ^A

434 Cash income is derived from several sources including the sale of copra, fresh coconuts, bananas and other produce, fish, and handicrafts.

A.[See p. 74--Analyst]

462 edible wild fruits, pandanas for weaving, and mulberry wands (hiapo) which provide the bark for tapa cloth.

463 335 178 Specialization is common and always part-time. Two men in Puke are specialists in carpentry and neatly divide the available demand by one specializing in the knowledge of traditional carpentry and the other specializing in Western design and methods. Some projects call for the skills of both men, thus affording them a chance to contrast their approaches. While one scurries about taking measuremnts with a steel ruler and making references to smudged pencil marks on paper scraps, the other relies on eye-balling and his ability to reassure others with knowing grunts of wisdom. Oddly, the two techniques seem compatible, both being equally incomprehensible to non-carpenters.

463 Other specialties found in Puke were the construction of fishing paraphernalia, the practice of native medicine by both men and women, [226] undertaking, and canoe building, The village fishermen are also recognized as specialists, particularly a man who was the only one who could consistently take lobster by what was understood as a secret method. No individuals seemed to be recognized as specialists in gardening, but some of the older men were conceded to be the most knowledgeable in that area.

241 Gardening

Utilization of the garden plots follows a rotation plan wherein products most important in terms of their social prestige are planted and harvested immediately following a fallow period. The next crop

241 planted is usually of less importance than the first and so on until the land is returned to fallow status. A typical garden sequence is yam ('ufi), perhaps two crops in succession of taro (talo), and then cassava (manioke) is planted until the plot is exhausted. The amount of care given a garden is an indication not only of the amount of care a certain crop might need, but also indicates the social value derivable from that crop. Thus yams receive more care than taro, and so on.

[412] All gardening done in Puke is accomplished with the use of three hand tools: the ubiquitous bush knife, the push hoe, and a long-handled spade. Fallow periods plus whatever nutrients the soil might receive from burning the brush before a first planting are the only aids utilized to refurbish the soil. Commercial fertilizers provided free by [654] the Agricultural Board are, however, now being used on palms. Ususally no effort is made to prevent wandering animals from a garden and pigs sometimes do extensive damage.

[731] In some years droughts threaten crops in the dry, cool months from [132] May to November, but irrigation is not practiced and is not practical [312] because of limited sources of water.

241 Most garden work is accomplished by men but wives often assist, 461 particularly in weeding. A Tongan anecdote proclaims that if a man takes his wife to the garden and has her work so that his work will take him toward her, he will be able to work much faster; but the situations both explicit and implicit in their theory are more fiction than real. [476] Men usually do choose to work together with at least one other man, and work groups of two to four are quite common. Sociability is important

241 in such groups and work progresses with a great deal of conversation
461 and joking; frequent breaks for drinking coconuts and smoking are also
476 important as is a midday break for eating and sleeping.

During 1971 seventeen of the adult men in Puke belonged to work groups called *kautaha toungāue* 'association that works in rotation'. There were two such groups, one having a membership of ten and the other a membership of seven. Each group had a timekeeper but no other leader. The tasks undertaken by the groups were planting and hoeing for each member in the following manner. Each day on which the *kautaha* was to work, each member had one hour in the morning to work on his own garden plot; the remainder of the day the entire membership worked on the land of one member. The order of rotation was established by the criterion of the proximity of each garden to the village, group work beginning in the closest garden and ending at the most distant.

The basis of membership in these groups seems to be residence and friendship, as all members of one group reside in the northern half of the village and the members of the other group all reside in the southern half.

423 All household heads in Puke have access to land through one of the
426 following: (1) legal usufruct rights based on registration with the
427 government, (2) usufruct rights granted by the noble holding the estate, or (3) usufruct rights "loaned" by a person holding land by one of the other two methods. In the village thirteen men hold land as legal registrants, fourteen hold land at the discretion of a noble, and fifteen use land of a kinsman or friend.

In areas of more moderate population density (about 300-400 423
persons per square mile) the pattern of land distribution on 182
estates which have been fully subdivided is shown in the figures [161]
for Ha'akame, Nukunuku and Ha'ateiho.A Here most households
have either eight acres or no land at all, although in Ha'akame
several taxpayers hold twelve-acre allotments and a block of
thirty-three acres is held as a lease by the only man of rank in
the village. Where the population density falls to about 200 [161]
persons per square mile or less the pattern on subdivided estates
is represented by the figures for Niutoua in eastern Tongatapu
(see Table 1 and Figure 1),A where only three per cent of the
households in 1962 were without land. Yet even there about
eighteen per cent of the taxpayers had no land, because one-third
of the registered allotments on the estate were held by people
who lived in other settlements, mostly either in Nuku'alofa or
in other villages in eastern Tongatapu. Where subdivision and
allocation of allotments is not complete the proportion of taxpayers
and households without land is very much higher, as is
shown in the figures for Vaini in central Tongatapu, where in
1962 about one-half of the estate was still in customary holdings.
The recent allocation of allotments has significantly altered the
pattern of land distribution on this estate, but has had little or
no effect on the other villages discussed above.

The significance of this unequal distribution of land between 423
individuals and households needs to be carefully assessed, for 425
the borrowing of land from relatives, friends or estate-holders is
common. It is fairly easy to obtain the use of land for growing [241]
short-term and largely subsistence food crops, even in densely
settled areas, although many men claim that it has become more
difficult in recent years. Where land is borrowed from a relative [427]
often no direct return is made, but when borrowing from others [602]
it is customary to give part of the crop, such as a basket of yams,
to the landholder.

Obtaining the use of land for cash cropping is more difficult, 423
and although it would be hard to find a family short of food 425
simply because it could not borrow enough land for gardening,
households without land tend to have significantly lower cash 241
incomes than households with land. Borrowing for cash cropping [434]
particularly has become more difficult over the last two years, [178]
for with the improved market for bananas landholders have
expanded their own plantings and are less willing to lend their
land to others, especially for more than one or two years. In 423
Tongatapu today it is not unusual to find people having to pay 427
for the use of land for cash cropping, although renting without 241

A[See Category 423, pp. 109, 117--Analyst.]

423 Cabinet approval is illegal, and Cabinet approval is not given
427 for land renting between Tongans. In fact, some of the more
241 enterprising and large-scale banana growers and market gardeners,
who can afford to pay rent and to contribute food crops
and pigs to the estate-holder or landholder, have little difficulty
in obtaining the use of land, though their tenure is insecure and
423 unprotected by law. Land cannot be borrowed for planting
coconuts, a long-term cash crop, and palms on an allotment are
425 the property of the landholder, regardless of who planted them.
245 A common practice for those without land, therefore, is to
obtain permission to collect one or two cart loads of coconuts
for copra making from the allotment of a relative or close friend,
and for this no return is given. Another arrangement, especially
between non-relatives and where the landholder lives elsewhere,
is for the cash received for the copra to be shared half and half.
434 Despite these arrangements a survey undertaken in four villages
in Tongatapu showed that in 1961 the *per capita* cash crop
[24] income of households with no land ($T18.40) was only half that
of households with eight acres (Maude 1965:155-6). Yet only a
few of the landless men interviewed throughout Tonga seemed
to experience hardship from land shortage; most considered their
income sufficient for essential needs and some with energy and
enterprise had higher cash incomes than many men with their
own allotments. A few men in Ha'apai and Nuku'alofa with
large families to support, however, did appear to feel under
pressure.

423 In theory the Tongan system should have encouraged the
movement of people from areas of land shortage to the more
166 sparsely populated districts, for although an estate-holder may
425 refuse a person from another locality permission to reside upon
his estate, he cannot prevent such a person holding an allotment
there, unless the Land Court rules against the grant. Some migration to obtain land has taken place over the last few decades, mainly from Ha'apai to central and eastern Tongatapu, but for reasons already mentioned it has not been easy to obtain land in the areas where allotments should have been available. Furthermore, acquiring land on an hereditary estate has usually been more difficult for a stranger to a village than for a local man, for the responsibility of an estate-holder towards his own people does not necessarily extend to others, and many people feel that the lands of an estate should be reserved for the people who traditionally belong there. Consequently in all the villages for which figures are available the proportion of men without

land is much higher among in-migrants than among those who 423
belong there by birth (Maude 1965:118-19, Nayacakalou 1959:111), 166
and the difficulty and uncertainty of obtaining an allotment has 425
probably deterred migration from the densely settled areas. At the same time there has not been much opportunity for those who have allotments in these areas, but who have moved elsewhere, to exchange their old holdings for new ones (an exchange which is provided for in the Land Act) and so make land available for others, as should have happened in the case of Ha'afeva discussed earlier.

The main direction of migration within Tonga in recent years, 166
moreover, has been towards Nuku'alofa and other parts of Tongatapu 369
where the opportunities for earning money and the better
educational facilities have been more important attractions than 423
the possibility of obtaining land. People have been much less interested in moving to 'Eua and to western Vava'u, where land has been the only attraction (Maude 1965:81-6, Walsh 1964b: 188). Thus internal migration has only partly led to a better distribution of land; it has had only a small effect on the tenure problems of the densely settled areas, and among the rapidly-growing population of Nuku'alofa a large proportion of households are landless. In a sample survey of households in the town Walsh (1964b:63) found that only forty-nine per cent had a tax allotment on Tongatapu, sometimes miles from the town, while another six per cent had land elsewhere in Tonga. In the 1966 census only thirty-three per cent of taxpayers in Nuku'alofa stated that they had a tax allotment.

LAND TENURE AND AGRICULTURAL PRODUCTION

The Tongan land tenure system also needs to be assessed in 121
terms of the way in which land is used. Has this system, with its individual title to land and security of tenure, proved a satisfactory basis for cash cropping, and has it fostered the development of independent small holders free of some of the problems found with more traditional systems of land tenure in other parts of the South Pacific?

Cash cropping in Tonga has been largely confined to coconuts 423
and bananas, but there is no indication that land tenure has 182
been a factor in the non-acceptance of other crops. The early 178
stages in the development of the present tenure system were
apparently marked by an increase in cash cropping, for Rutherford 245
(1966:58-9) quotes the opinion of Maudslay that the 1862 [241]

423

allocated land left for leasing. Consequently land borrowing by 425
those who already have allotments of their own is common, and 182
land use by no means coincides with the tenure of land. Yet
borrowing is not always a satisfactory solution, for the borrower
can seldom obtain land except for a short period and for short-
term crops. While the more enterprising therefore tend to be [311]
hampered by the land tenure system, the lazy are protected, for
at present the government makes no attempt to enforce the pro-
visions in the Land Act requiring landholders to cultivate their
allotments and plant coconuts.

Land borrowing may also restrict the lender's control over the 425
use of his holding for, despite individual tenure, requests from 571
close relatives and friends for the temporary use of land are 602
difficult to refuse, and such requests are not necessarily made [423]
only to those who have land to spare. Social obligations of this
nature also restrict the independence of the farmer in other ways
familiar to the student of the South Pacific. For instance, rela- [241]
tives and friends may request a load of coconuts, a few baskets
of tubers, or cash, and consequently men trying to increase pro-
duction find their efforts hampered. Such obligations continue [178]
to be honoured partly because of tradition, sentiment and the
prestige gained by the giver, but also because they still fulfil [554]
their essential function of ensuring the security of the individual [182]
and his family. Marriages and funerals also involve obligations
of kinship and friendship. A study of the literature on Western 571
Samoa and Fiji, and the comments of Tongans who have lived 602
in Samoa and Samoans who have lived in Tonga, suggest that
the Tongan farmer may be able to achieve a slightly greater 423
degree of independence, without having to contract out of his 182
society, than is the case in the neighbouring territories, and for 241
this the system of landholding is probably largely responsible.
At the same time, however, individual tenure in Tonga has not [171]
produced fully independent farmers, for social obligations still
restrict the individual's control over his land, his time and his
produce.

SOME BENEFITS OF THE SYSTEM

Although various factors have thus restricted the effectiveness of 423
the Tongan land tenure system both as a method of land alloca-
tion and as a basis for land use, it has many good points. It has 182
provided many men with secure, lifetime, individual leaseholds
which can be passed on to their descendants; it has enabled
Tonga to avoid the problems of fragmentation, subdivision and

treat kava as if it were strong stuff. And so it is, but the strength 276
comes from society, not from the vegetable kingdom.[3]

Before I describe the ceremony, here are a few background
facts about the Kingdom. Tonga is a Polynesian society consisting 105
of about 150 small islands with a population of about [161]
70,000 people. It has a Treaty of Friendship with Great [648]
Britain, but has always been independent, never a colony, a
fact of which Tongans are very proud. The people have been [779]
Christian for 130 years and virtually everyone can read and [212]
write. Tongans practise subsistence farming on small holdings, [241]
with coconuts and bananas as the main cash crops. There are [434]
no extremes of wealth or poverty. For the past 100 years [642]
government has assumed the form of a constitutional monarchy.
Anyone who saw Queen Sālote of Tonga at the coronation
of Queen Elizabeth in 1953 will not be likely to forget
her. She is as memorable in Tonga as she is in Britain. She died [643]
in December 1965 and was succeeded by her eldest son, the
present King Taufa'ahau Tupou IV.

DESCRIPTION OF THE CEREMONY

The basic form of the kava ceremony is always the same, though 276
it may vary from a small informal gathering of four or five 574
people to a huge assemblage of several hundred people. It
can be dressed up or down as the occasion requires. It takes
place on many different sorts of occasion: when men visit
each other just to talk; when welcoming home relatives who
have been away; in courtship; at weddings; at certain points in
a funeral; at the appointment of a king and later on at his
coronation; and similarly at the appointment of a chief and on
the occasion when he first presents himself and his villagers to
his King.

Figures 1 and *2* show the seating at an informal and at a
formal ceremony. The participants sit cross-legged, with the 276
chief whose title is genealogically the most senior at the head of 574
the circle. He has an official called a matāpule on either side of 565 [516]

[TEXT CONTINUED ON PAGE 210]

state, church, and education. As a surviving, highly visible sector of legally 565
supported hereditary privilege, offering exclusive access to sources of wealth, 178
influence, and power within the Tongan new order, the nobles are increasingly 565
criticized by Tongans and outside observers as a source of injustice in a society
that was created on the themes of emancipation and individual liberty. The 178
tempo of such criticisms has increased significantly since the succession in 829
1965 of Tupou IV, who is committed to modernization and closer relations 185
with other regional and world governments.

Although viewed stereotypically by some as an anachronistic and 565
conservative segment of society, the nobility in terms of the composition and
activities of its membership cannot be fairly characterized so one-dimensionally.
As social historians have shown for old elites in the transformations of European [171]
societies (see Moore, 1967; Stone, 1965), the composition of Tonga's hereditary
nobility, although fixed and rigid in principle, has been characterized by a
degree in fluidity. Further, its response to generally modernizing and liberating
changes has in fact revealed some degree of flexibility and accommodation.

Issues raised in the public litigation of noble succession, a matter determined 565
by law and the Tongan Land Court, offer a perspective on the nature of the 428
social composition of the nobility and also on the significance of the noble
title system as a determinant of social status in modern Tonga. The purpose 121
of this paper is to present a detailed account of noble succession disputes and
to discuss what these disputes indicate concerning the position of the nobility
in modern Tongan society. I have described the modern social contexts and 114
activities of the nobility elsewhere (Marcus, 1975b).

Trends of Change in Tongan Society

The Kingdom of Tonga consists of an archipelago of 150 islands with a 131
total area of 269 square miles. These islands are just west of the International
Dateline, about 430 miles southeast of Suva, Fiji, a similar distance southwest
of Western Samoa, and about 1,200 miles northeast of Auckland, New Zealand.

Only about 36 islands of the archipelago are inhabited, and these are 361
clustered in three main groups: the southern or the Tongatapu group, including
the single largest island of the Kingdom, Tongatapu, on which the port capital
of Nuku'alofa is located; the middle or Ha'apai group of widely scattered small
islands; and the northern or Vava'u group of islands. The rapidly increasing 161
population has been estimated to have reached 100,000. In recent years, land
shortage and rising aspirations, resulting from increased contacts with the outside, 178
have been accompanied by marked increases both in internal migration from 166
the outer islands to Tongatapu and in temporary and permanent migration 167
abroad to countries such as New Zealand and the United States. The Tongan
economy is predominantly agricultural, based on mixed-crop production by 433
241

433
241 village- and town-dwelling small-holding farmers of a variety of root crops for subsistence and of copra and bananas for cash.[3]

643 The pre-contact Tongan political and social system was a highly stratified
565 kingship, which was an extreme case of the hierarchical social organization for
175 which Polynesia has been culturally typed (see Gifford, 1929; Goldman, 1970;
171 Sahlins, 1958). The pre-contact sacred kingship of the Tu'i Tonga had been
177 increasingly challenged by the political competition among ruling chiefs for
797 over two centuries, when Wesleyan missionaries, arriving in 1826, began a
process of thorough westernization of indigenous institutions. Enthusiastically
643 accepting Christianity and the advantages of western ideas of law, government,
178 and education, the powerful chiefly leader, Tāufa'āhau,[4] as the Christian king
George Tupou I, united the islands under a constitutional monarchy and a
178 strong Wesleyan church organization. Although later a British protectorate
177 (1900-1970), Tonga was the only polity in Polynesia to maintain indigenous
642 sovereignty and remains the only surviving Polynesian kingship.[5]

[648] The institutional and legal framework for the new order has remained
[171] virtually intact during the reigns of the four monarchs of the Tupou dynasty
(Tupou I, 1875-1893; Tupou II, 1893-1918; Queen Sālote, 1918-1965; and
Tupou IV, 1965-). The major pre-contact social and political institutions
were replaced by a monarchical state (with the kingship defined as part of the
conventional executive, legislative, and judicial branches of western government)
177 and Christian church organizations. On the other hand, a number of indigenous
customs and values were assimilated to the innovations and persisted, particularly
178 in the important everyday-life contexts of kin relations and of the production
and exchange of traditional foodstuffs and goods such as barkcloth and mats.
This early, stable complex of institutions, ideas, and practices, which integrated
Tongan culture with a version of European culture, remained isolated during
the early twentieth century as a neo-traditional or compromise culture and is
only now being challenged by increasing political and economic contacts with
other regional and world nations.

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[3] The following are major sources on recent Tongan demography and economics: Bollard (1974), deBres (1974), Maude (1965, 1971), Sevele (1973), and Walsh (1964). The following are sources on modern Tongan society and culture: Aoyagi (1966); Beaglehole (1941), Kaeppler (1971), Korn (1974) Marcus (1975a, 1975b), Merton (1972), and Rogers (1968, 1975).

[175] [4] There were actually three kingships in Tonga in the century before the Constitution. In the 15th century, the 24th incumbent Tu'i Tonga conferred supreme secular power on his younger brother, while retaining for himself the highest sacred status, thus initiating a collateral line of kings called the Tu'i Ha'a Takalaua. The 6th Tu'i Ha'a Takalaua, repeating the earlier split in authority, conferred considerable authority on one of his sons, thus creating a second line of major societal chiefs or kings, the Tu'i Kanokupolu, collateral to the sacred Tu'i Tonga kingship. Tāufa'āhau was the 19th Tu'i Kanokupolu.

[5] Major secondary sources on Tonga's transformation and recent history are Lātūkefu (1974); Rutherford (1971), and Wood (1932, 1975).

than the way in which they noose sharks ; instances of sharks attacking 226
natives are very rare. Whales are sometimes caught. Turtles are also 225
plentiful. Perhaps the most interesting creature in Tonga is a land-tortoise,
now kept in the Palace grounds at Nuku'alofa, and reputed to 231
have been left by Captain Cook ; it has been scarred by bush-fires and 825
other accidents, but in its old age it is honoured as though it were a chief
and is called Tu'imalila, after a part of Labaha called Malila. 552

The graceful coconut-palm is the most distinctive as well as the 245
most valuable of plants in Tonga. All parts of the islands being very
close to the sea, coconut trees thrive everywhere, and copra, the dried
kernel of the nut, is the staple product. Other plants which grow in 241
profusion are many varieties of banana, plantain, yam, sweet potato,
talo, manioc, sugar-cane, pineapple, breadfruit, papaw-apple, mango and
arrowroot. Coffee, cocoa and cotton have been introduced but are not
yet extensively grown. Various European vegetables have also been
introduced, and corn has proved the best cereal for this climate.

Bananas, sweet potatoes, pineapples, tomatoes, pumpkins and 439
oranges could be exported in abundance, if markets were available. The
staple foodstuffs of the people are yam, sweet potato, talo, manioc, kabe, 262
plantain, breadfruit, etc.

The bark of the paper-bark mulberry is extensively used for making 824
native cloth (taba and gatu), and the sap of the koka tree is used for [287]
stamping this cloth. Mats are made from the leaves of the pandanus,
but unfortunately this domestic manufacture is declining generally, [285]
except in Ha'abai. The trunks of the toa (ironwood) and koka are used [178]
for the posts of native buildings, but timber generally suitable for building [313]
European houses is not found in Tonga. The ironwood or casuarina
tree was used for making clubs and spears formerly, and is still used for
spade handles and mallets. The best of the old canoes were brought 505
from Fiji, where more suitable timber for all purposes is available. 439

Kava, the juice of a species of pepper-plant, is the national drink 276
on all occasions. Other interesting trees are the ovava, a species of
banyan ; gatae and tuitui (candle-nut) used for marking boundaries ; 137
Malayan apple or fekika, fava, and the ifi, whose leaves were hung round
the neck in token of surrender or penitence in olden times. 824

Government statistics in 1931 show a total of 2,658,644 coconut 245
trees and 832,655 banana plants in the Kingdom, 94% being owned by
Tongan cultivators.

EXPORTS.

Tonga is entirely an agricultural country, being without minerals 433
and secondary industries. It is unfortunate that there are still fairly
considerable areas of undeveloped land even in such a small country, 433
especially in Togatabu and 'Eua, and further that several hundred taxpayers 311
have no allotments ; this latter condition is mainly due to indolence
on the part of some who live in the chief towns, but in the case of the
overcrowded islands of Ha'abai it rises from rather a natural reluctance
to leave an old home. The Government is now making strenuous efforts 179
to enforce both more systematic cultivation of coconut-growing land and 245

88: Thaman

OU9 Tonga OU9

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[For scattered information on these topics, see Category 137 or 824, pp. 377-431.]

88: Thaman K-5 (1967-1973) 1978 OU9 Tonga OU9
Tongatapu

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ABSTRACT OF THE DISSERTATION

The Tongan Agricultural System: With Special Emphasis on Plant Assemblages

by

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105 241 178 177 Despite continued exposure to foreign technologies and value systems, the Tongan agricultural system is still characterized by bush-fallow cultivation and a dependence on root crops grown in association with a great variety of traditional and some recently introduced cultivated and wild plants. The system, however, seems to be undergoing rapid change due to a number of factors, including increasing population pressure on land, increasing dependence on the cash economy and commercial agriculture, and introduced 121 technology. This dissertation attempts to examine the system as it existed in 1971-1972 in order to gain a better understanding of the nature of the plant assemblages, their importance to the Tongan society and present and future

121 developmental trends.

101 The research was conducted from January 1971 through
January 1972 on the main island of the Tongan archipelago,
127 Tongatapu. Data sources included archives and government
124 departments, aerial photographs, market studies, personal
interviews, questionnaire surveys, and in-the-field in-
121 ventories of random samples of agricultural holdings. The
423 major foci of the study were the plant assemblages found
241 on bush and town allotments, to which all Tongan males over
16 years of age are entitled. The bulk of agricultural
241 produce comes from the bush allotments which average about
8 acres (3.2 hectares) in size, with additional produce
coming from town allotments where residences are normally
found, and which average about 0.4 acre (0.16 hectare) in
area.

Survey results indicate that approximately 34 percent of the area on bush allotments was under cultivation, the rest remaining in various stages of fallow. Of the cultivated area, 87 percent was devoted to subsistence cropping, 11 percent to commercial cropping, and the balance to a combination of the two. The most widespread staple crops were manioc, American taro, yams, sweet potatoes, taro, giant taro and plantains. Bananas comprised 42 percent of the commercial acreage with the balance consisting of crops such as watermelons, pineapples, peanuts, plantains, corn and garden vegetables. Intercropping was

241 common with subsistence crops but uncommon with commercial crops. In addition to these crops, there was a great range of food and non-food plants, plus over 90 tree species which were either cultivated or protected on bush allotments. Almost all these plants, including many species found in the fallow vegetation, are of some value to Tongans as sources of food or for purposes such as house construction or the preparation of handicrafts, folk medicines, dyes, scents, decorations, or other material goods. The town allotments had a similar range of food and non-food plants and likewise constitute a valuable agricultural resource.

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178 Despite the seemingly unchanged nature of the agricultural system, definite trends or developmental paths are evident. These include: an increase in number and decrease in size of bush allotments with a concomitant intensification of agriculture; an increase in cultivation on town allotments as bush allotments become unobtainable; an increase in cultivation of commercial crops and the use of scientific farming methods; an increase in cultivation of crops used for handicrafts; an overall replacement of traditional crops and natural vegetation by recently introduced plant species and varieties. In short, it seems that the Tongan agricultural system is likely to undergo rapid change with the possible extinction of many valuable plant species. This seems to be happening with little

88: Thaman K-5 (1967-1973) 1978 OU9 Tonga OU9
Tongatapu

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consideration being given by developmental planners to the considerable cultural and ecological importance of these plants.

178 the most sophisticated island cultures in the Pacific, can
648 be at least partially traced to a number of factors: 1)
433 Tonga is the only major Island group in the Pacific that
has never been directly under the domination of a foreign
power; 2) all land is owned by native Tongans; 3) Tonga
is situated in a comparatively isolated and unstrategic
location; and, 4) apart from agricultural produce, land,
and human labor, Tonga has no known resources of any
substantial economic value to foreign interests.

178 As a result, the traditional Tongan agricultural
241 system is in many ways much the same as it was when Tasman
[433] first discovered the archipelago in 1642. The diet is
[262] still based on root and tree crops as part of a "bush
fallow" system, and many medicines, cosmetics, beverages,
fibers, ornaments, and other subsistence needs are ful-
241 filled by the present agricultural system. However, as
433 stated by Schultz (1964: 3),

> The man who farms as his forefathers did cannot produce much food no matter now rich the land or how hard he works. The farmer who has access to and knows how to use what science knows about soils, plants, animals, and machines can produce an abundance of food though the land be poor. Nor need he work nearly so hard and long. He can produce so much that his brothers and some of his neighbors will move to town to earn a living. Enough farm products can be produced without them. The knowledge that makes this transformation possible is a form of capital whenever it is an integral part of the material inputs farmers use and whenever it is a part of their skills and what they know.

241 The present Tongan farmers have a wealth of empirical
433 knowledge about their environment and traditional crops and
cropping practices. Unfortunately, as suggested by
Schultz, new forms of capital are needed to provide for the
241 future. Foreign degrees in agricultural science, agri-
433 cultural machinery, pesticides and fertilizers, breeding
178 stock and planting material from overseas, and technical
177 and financial aid are already beginning to bring about
242 changes in the traditional agricultural system.

Nature of Study

128 It is the primary aim of this dissertation to look
at the Tongan agricultural system as it existed in 1971-
1972. Particular emphasis will be placed on plant species,
plant associations, and selected agricultural practices.
121 There are two major reasons for conducting an investigation
of this nature. The first is the general concern which
geographers have for man's relationship with and effect on
the earth. A much more immediate reason, however, is
that because steadily increasing population pressure is
forcing agricultural systems to change dramatically, better
understanding of traditional agricultural systems can help
effect change with minimum cultural disruption and shock.

Studies which have dealt with some aspects of traditional Pacific Island agricultural systems are numerous. Most of these fall into four general categories:
1) general descriptions of the agricultural landscape and

121 be treated on a statistical as well as a descriptive basis with respect to their distribution and frequency. The study will also examine significant input variables and outputs of the system. The components of the study can be summarized diagramatically:

INPUT VARIABLES	RESULTANT SYSTEM	OUTPUTS
Pool of Plant Species Environmental Parameters Cultural Practices	Traditional Tongan Agricultural Plant Assemblages	Products of Economic and Social Value

Scope of Study

For practical reasons, the study was restricted to the main island of the Tongan Archipelago, Tongatapu. The problems associated with the acquisition of field and other data are considerably reduced on Tongatapu owing to its superior transportation network and the presence there of almost all government departments, archives, and other sources of published materials.

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[121]
The focus will be on the agricultural system as practiced on the traditional bush allotments (*'api 'uta*) and town allotments (*'api kolo*). Excluded are limited areas of government, royal, noble, and leasehold land. There were recorded (as of December 1971) 5652 *'api 'uta* on the island of Tongatapu, averaging just over 8

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423 acres (3.3 hectares) in size. The 'api kolo are somewhat fewer in number and average about one-quarter acre (0.1 hectares) in size.

Methodology

101 The majority of the data utilized in this study were collected on Tongatapu from January 1971 to January 1972. [114] Preparatory work was carried out during 1968 and 1969 while the author served as a United States Peace Corps Volunteer in Tonga. Some additional data were collected in February 1973.

12 The methodology used in acquiring the necessary data included: 1) a literature survey; 2) interviews; 3) a detailed study of the land tenure system; 4) research carried out in government departments; 5) a study of the market-place; 6) the use of aerial photography; 7) detailed ground reconnaissance survey; 8) the administration of a questionnaire; and 9) the collection and identification of herbarium specimens.

127 The literature survey was conducted in California and Tonga and at the Bernice P. Bishop Museum in Honolulu 124 and the Western Pacific Archives in Suva, Fiji. People interviewed included His Majesty King Taufa'ahau Tupou IV, members of government boards and departments, farmers, and other people knowledgeable on various aspects of Tongan agriculture and botany.

127 of Overseas Surveys, was used in the construction of an
128 agricultural land use/vegetation map of Tongatapu and a
transect across the island. The agricultural land use/
vegetation map was constructed on a cellulose acetate
overlay using a photomosaic (46 photos). Most boundaries
were later field checked and verified or corrected as
necessary.

125 The transect across the island was constructed using
a single photo of a 2.04 mile (3.29 kilometer) strip between
the windward south coast (the liku) and the northern
lagoon (Tahi Kele). The transect was drawn on an acetate
overlay and sectioned into 52 equal segments of approximately
69 yards (63.3 meters) each. The entire length
of the transect was then paced, and at each 69 yard interval
the crop types, plant species, agricultural practices, and
133 elevational changes were recorded. The transect illustrates
137 the heterogeneity of the Tongan agricultural landscape from
the steep windward south coast, which is characterized by
littoral forest and savanna, to the low-lying leeward north
coast, which is characterized by swamp and mangrove forests.

125 Random ground reconnaissance surveys were made of
both the bush allotments ('api 'uta) and the town allotments
('api kolo) to gather accurate statistical data on
[423] the nature of the agricultural system. The land tenure
[241] system in Tonga is ideally suited to a random sampling
survey because all of these allotments have been surveyed

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[241] and the gardens of each individual farmer are generally confined to the area of single bush and town allotments.

The sampling survey of the bush allotments was based on the total of 5,652 allotments on the island in 1971, comprising about 45,214 acres (18,085 hectares). A map of these allotments (Figure 1)provided an excellent base from which a random sample of 101 allotments was selected (Figure 2) using a random numbers table. Each of the 101 'api 'uta was visited and an inventory of relevant agricultural phenomena was taken. 125

As a result of preliminary study, an inventory scheme was generated (see Appendix A)^A^ which took into account 263 different types of agricultural phenomena, which were classified as to their number, area, condition, etc. depending upon the nature of the particular phenomenon.

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126 The following procedures were used to survey the 101 sample bush allotments ('api uta): 1) accurate maps for each sample allotment were drawn using survey books at the Land and Survey Department; 2) using these maps in the field, the boundary markers were located; 3) using pacing techniques, the acreages for all major crops and the location of all other trees and plants were plotted; 4) acreages of fallow ground were mapped and categorized with respect to the stage of regrowth; 5) data on the occurrence of other agricultural phenomena and practices were recorded; 6) upon completion of work in the field

A [See Category 125, pp. 350-358--Analyst.]

[TEXT CONTINUED ON PAGE 131

133 **Tongatapu is barely above sea level in the north, and rises very gradually towards the south, with the highest point being about 270 feet (85 meters) in the vicinity of Fua'amotu and Nakolo in the southeast. Most of the island is less than 60 feet (17 meters) above mean sea level.**

In the north-central portion an extensive but shallow central lagoon, known as Fanga 'Uta or Tahi Kele, extends some four to six miles (6 to 10 kilometers) into the island. Around this lagoon and along the north coast of the island near the towns of Hofoa, Folaha, and Navutoka, there are low-lying swampy areas.

The upraised, windward south coast, or liku, has rugged limestone cliffs and terraces, ranging from about 20 to 150 feet (6 to 46 meters) in height. Along the south-western portion, there are extensive blow-holes caused by wave action on the porous limestone terraces.

The surface of the island is flat to gently undulating with only a few small hills rising above the surrounding terrain and no surface streams.

There are scattered reef islets, or motu, along the north coast and the entire island is surrounded by a broken fringing reef of variable width.

[312]
[241] **Owing to the absence of surface streams, subsurface hydrology is an important consideration. Some pumpwell irrigation is practiced and rainwater is collected in many storage tanks, but the main water sources are springs** and wells.

132 out the year (Table 2) and have a definite moderating effect on the yearly temperature range. From May to November, the winds blow mainly from the east-southeast, but during the

Table 2. Mean annual frequencies of wind directions (speeds over 3 knots) at Nuku'alofa (1963-1970).

	N	NE	E	SE	S	SW	W	NW
%	6	9	38	26	14	3	3	2

"hurricane season" (from late November to early April) they commonly blow from the east. During this same season, strong winds accompanied by heavy rain occasionally blow from the north or northeast. There is also a period from May to September when southerly winds often predominate.

The mean wind speed throughout the year is 9 knots and the mean range between the calmest and windiest month is only 5 knots. Heavy winds associated with tropical cyclonic activity are occasionally experienced from late November to early April. The frequency of these tropical cyclones is much greater in the northern Tongan islands
132 than in Tongatapu (Cumberland, 1961:16). Nevertheless,
73 these heavy winds, which are referred to by the Tongans as
241 *afa*, occasionally cause considerable agricultural damage on
[821] Tongatapu. Since 1951, there were three tropical cyclones with winds from 40 to over 60 knots. These destroyed, respectively, almost 100%, 50,75% of the currently

132 731 241 bearing banana trees as well as many green coconuts and other food crops in the eastern parts of Tongatapu (Tonga Chronical; January 17, 1960: 1, November 27, 1964: 1; and January 16, 1970: 1). Associated with these winds are heavy rains, which add to the damage by loosening the soil and root systems of plants.

[821] Although the cyclonic *afa* is the most common gale force wind, there are also infrequent local whirlwinds, known as '*ahiohio*, which cause considerable damage. Such an '*ahiohio* hit the southern islands of the Ha'apai group in January 1968 and destroyed 90 percent of the banana crop as well as coconut trees, breadfruit trees, and other valuable subsistence food crops (*Tonga Chronicle*, February 2, 1968: 1 and 8).

132 Rainfall

Seasonality in Tonga, as in other tropical areas, is based more on rainfall than on temperature differences. The mean annual rainfall for Tongatapu is 74 inches (187 centimeters) per year, most coming between late November and early April (Table 3). The rainiest year on record was 1971 with 114 inches (291 centimeters). The driest was 1946 with 39 inches (99 centimeters). The wettest day on record was January 24, 1952 with 11 inches (28 centimeters) of rain. The average annual number of rainy days (more than 0.01 inches or 0.025 centimeters) is 167.

132 The cyclonic storms, although much
[731] more severe and harmful to the agricultural economy, are
[241] infrequent and account for only a small proportion of the
total rainfall over a period of years. Local convectional rainfall also contributes to the annual total.

Although, on the average, there are wet and dry
seasons, there is considerable variability from year to
132 year and rainfall is often unreliable (Figure 6). Periods
241 of drought are often experienced between April and
731 December, which affect copra yields, banana production, and
[134] subsistence crops. These periods of drought generally
last no longer than one or two months, but even spells of one to two weeks can be detrimental to agriculture owing to the free-draining nature of the soil.

The unpredictable rainfall regime on Tongatapu also has periods of excessively heavy rain, which reduce yields of important tree crops. In 1972, for example, heavy rains during the flowering period of mango trees (Mangifera indica), according to Tongan informants, reduced the usually abundant mango crop on Tongatapu by an estimated 95 percent.

132 Despite occasional adverse conditions, the rainfall of
241 Tongatapu is adequate to support not only the plant
182 assemblages of the traditional Tongan agricultural system
132 but also many introduced crops. Moreover, this rainfall,
is uniformly distributed throughout Tongatapu owing to the absence of significant topographic differences.

132 **Humidity**

The humidity in Tongatapu is relatively high throughout the year, averaging about 79 percent, with only minor differences from one season to another (Table 5).

Table 5. Mean relative humidity, Nuku'alofa (1949-1970).

	J	F	M	A	M	J	J	A	S	O	N	D	Annual
%	81	82	83	81	77	78	76	76	77	77	77	78	79

Although no quantitative data are available, sunny days on Tongatapu far out-number cloudy days.

132 In short, the climate of Tongatapu is mild and moist,
182 having adequate warmth, rainfall, and sunshine to support
241 a viable agricultural system. However, the yearly distribution of rainfall is unreliable, and often brings about periods of prolonged drought. The occurrence, although infrequent, of gale force winds also proves to be an adverse climatic factor.

Soils

127 Only limited data are available on the properties and distribution of Tongatapu soils. A preliminary soil survey was carried out by the New Zealand Soil Bureau (Gibbs, 1969) and analyses of selected soil samples have been carried out by Cottrell-Dormer (1941), Maude (1965), and Spier (1971). It is primarily upon these data that the

134 matter, but the overall pH is slightly alkaline. With respect to the major plant nutrients, these soils are characteristically high in available calcium, low to moderate in nitrogen, very low to low in available phosphorus, moderate to high in available potassium, and very low to high in available magnesium (Cottrell-Dormer, 1941; [241] Maude, 1965; Gibbs, 1967; Spier, 1971). These analyses are reflected in the increasing use of N-K-P fertilizer for commercial crops. Some European farmers also spray with magnesium, and according to an expert in market gardening, a deficiency in zinc is evident in citrus crops and in corn (Nakagawa, 1971).

Lowland Soils

The lowland soils, or tou'one, are shallow, loose, and rapidly draining, ranging from sands to loams in texture. They cover approximately 10 percent of Tongatapu. These soils are considered useful for most crops except yams and are similar to the regosols of many of the low-lying coral islands throughout the Pacific. They range in color from dark brown to brownish gray. They have been formed primarily from coral sand or limestone and small amounts of other marine debris, and perhaps minute quantities of volcanic ash. A major characteristic of these soils is the virtual absence of subsoil, the A horizon or topsoil being directly underlain by course sand or coral limestone.

134 Although the differences between the Nuku'alofa and
242 Sopu soils seem to be obvious, Tongans generally refer to
them both as *tou'one*. Some waterlogged hydromorphic soils
134 are distinguished as *'umea* or *kelekele'umea*. Lowland soils
or *tou'one* range from highly alkaline to neutral in reaction
and are low in available nitrogen, phosphorus, and
potassium and high in available calcium and magnesium.
Citrus and some other crops show an iron deficiency in
some low-lying areas (Nakagawa, 1971) and most nutrients
[242] are easily depleted by heavy cropping. Nevertheless,
Tongans find these soils suitable for most crops except
yams, and particularly suitable for sweet potatoes.

[241] In short, the soils of Tongatapu, although somewhat
[182] deficient in certain nutrients, provide an excellent basis
for traditional Tongan agricultural practices. Furthermore,
owing to the well-drained nature of most of the soils and
the lack of relief, few if any cases of soils erosion are
encountered on the island.

241 Primary Vegetation

A major feature of traditional shifting agricultural
systems is the felling of trees and other vegetation and
burning of the dried remains. When yields begin to decline,
a new section of forests or bush is cleared.
241 Theoretically, if given a sufficiently long fallow or
137 intercropping period, the primary vegetation should re-
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241 establish itself. Unfortunately, on Tongatapu, owing to
137 the limited land area, only in rare cases has the vegeta-
311 tion been allowed to return to a near climax community,
and little of the original primary vegetation remains
except along the coast and in a few protected enclaves.
137 Even in these areas, the vegetation has probably been
altered to some extent by over 3000 years of Tongan
occupance (Groube, 1971: 313).

114 A number of comprehensive studies of the Tongan flora
128 have been made (Hemsley, 1894; Burkill, 1901; and Yuncker,
1959); these studies however, have focused on the iden-
tification and listing of species and their uses and not
on plant communities and their areal distribution, which
is the focus of the following vegetational description.
The vegetation is here classified into eleven types
128 (Figure 8). These include primary vegetation types:
1) coastal littoral forest; 2) coastal savanna; 3) swamp
forest; 4) marshland; 5) mangrove swamps; 6) tropical
lowland forest; and secondary vegetation which is treated
separately. These types are based on physiognomic differ-
ences that were observable on the ground and on 1: 20,000
black-and-white aerial photography. Each of these types
was studied on the ground and subsequently mapped utiliz-
137 ing 1968 aerial photography. These associations are not
241 all directly involved in the agricultural system, but
311 they do reflect the agricultural potential of the different

[TEXT CONTINUED ON PAGE 39]

137 portions of Tongatapu. Moreover, they serve as reservoirs
241 or gene pools for many plant species which are part of the
[311] agricultural system. (Appendix E[A] lists scientific, Tongan,
128 common English names and the use of each plant species which was observed as being a major component of the flora.)

137 *Coastal Littoral Forest*

311 The coastal littoral forest is characteristically found on sandy or rocky soil in areas exposed to strong winds and salt spray. The major concentrations on Tongatapu are found along the east and west coasts of the island.
137 This association is characterized almost entirely by pantropic species that are common in the tropical Pacific Ocean.

On the sandy or rocky seaward edge of the forest, low, salt-tolerant vegetation predominates and depending on the particular area is comprised of the following dominant species: *Scaevola frutescens*, *Canavalia sericea*, *Ipomoea pes-caprae*, *Vigna marina*, *Wedelia biflora*, *Thuarea involuta*, *Spinifex littoreus*, *Pemphis acidula*, *Suriana maritima*, *Sesuvium portulacastrum*, *Euphorbia atoto*, *Cassytha filiformis*, *Fimbristylis cymosa*, *Derris trifoliata*, *Phaleria disperma*, *Vitex trifolia*, *Bikkia tetrandra*, *Colubrina asiatica*, and *Pandanus spp*.

Dense littoral forest generally begins directly behind this zone of low, salt tolerant vegetation and is characterized by larger trees including the following species: *Hibiscus tiliaceus*, *Macaranga harveyana*, *Barringtonia*

[A] [See Category 137, pp. 377-431--Analyst.]

137 *asiatica*, *Ochrosia oppositifolia*, *Casuarina equisetifolia*, *Thespesia populnea*, *Acacia simplicifolia*, *Tournefortia argentea*, *Hernandia ovigera*, *Calophyllum inophyllum*, *Desmodium umbellatum*, *Morinda citrifolia*, *Heritiera littoralis*, *Myristica hypargyraea*, *Premna taitensis*, *Gymnosporia vitiensis*, *Planchonella costata*, *Canthium barbatum*, *Guettarda speciosa*, *Cordia subcordata*, *Cerbera manghas*, *Ximenia americana*, *Terminalia catappa*, *Grewia crenata*, *Pisonia grandis*, *Pipturus argenteus*, *Pandanus tectorius*, *Mertya macrophylla*, and *Ficus scabra*.

The outer edges of the forest are often fringed with concentrations of *Pandanus spp*. The understory of this littoral forest includes such species as: *Acrostichum aureum*, *Piper puberulum*, *Derris trifoliata*, *Clerodendrum inerme*, *Centella asiatica*, *Achyranthes aspera*, *Epipremnum pinnatum*, and *Pandanus*. In open areas and on the inland margin of this forest, there is a common appearence of weedy secondary vegetation dominated by *Lantana camara*, *Carica papaya*, *Solanum verbascifolium*, *Passiflora spp*., and *Canavalia maritima*.

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311 Owing to the predominance of rocky or sandy soil and excessive salt spray, the sites suitable for this littoral forest and associated salt-tolerant scrub vegetation are unsuitable for agriculture. Nevertheless, some bush allotments ('*api* '*uta*) include considerable portions of this marginal land, and unsuccessful attempts are often made to farm it.

137 Psidium guajava. In the more mesic and open areas, the understory consists of Lantana camara, Indigofera suffruticosa, Psidium guajava, Stachytarpheta urticaefolia, Passiflora spp., Ipomoea spp., and Canavalia maritima. In both swampy and more mesic areas, exotics such as Lantana camara, Psidium guajava, and Stachytarpheta urticaefolia have become naturalized and constitute dominant species.

311 241 [134] The areas covered by swamp forest have in some cases been reclaimed by diking and refilling and, owing to the high organic content of the soil, produce high crop yields if waterlogging can be avoided. Many bush and town allotments contain portions of this swamp forest and, in most cases, although considered marginal for farming, provide a source of many plant products used by the Tongan society.

Marshland

137 [311] [133] Marshland associations, very limited in extent, are found south of Folaha and in the area just west of Kolomotu'a and north of the village of Hofoa. These have standing water throughout most of the year; the water is sometimes brackish owing to tidal ingression. The predominant species in this association are Cyperus javanicus, Ischaemum murinum, Paspalum conjugatum, Coix lachryma-jobi, Eleocharis dulcis, and Jussiaea erecta, with scattered Psidium guajava, Lumnitzera littorea, Hibiscus tiliaceus and Excoecaria agallocha. Again, exotics such as Psidium

137 *simplicifolium*, *Alyxia stellata* and *Dryopteris invisa*. Lianas and epiphytes include *Entada phaseoloides* and *Asplenium nidus*. A fungus, *Auricularia polytricha*, is also found growing on dead logs during rainy spells. In the more open and cutover sites, the exotics *Lantana camara* and *Psidium guajava* plus *Passiflora maliformis*, *Dioscorea bulbifera*, *Digitaria pruriens*, and *Paspalum conjugatum* are among the dominant understory species and often form dense thickets.

311 Regardless of the species composition, these remaining stands of tropical lowland forest represent probably
the best potential agricultural land on Tongatapu with
[241] respect to soil fertility. These areas have either never
been cultivated or have been under fallow for sufficient
time to allow for considerable replenishment of organic
[313] material and plant nutrients. Furthermore, these stands
are valuable sources of timber, firewood, and traditional
[437] medicines. The dried fungus is exported to Hong Kong.

Plant Species Important in Cropland and Secondary Vegetation

311 The cropland and secondary vegetation, which comprise
241 over 90 percent of the total land area of Tongatapu, are
137 characterized by a succession of gardens and fallow areas
128 in various stages of regrowth. A detailed description of
241 this vegetation, which is comprised largely of introduced
137 species, constitutes much of the core of this dissertation.

128 The individual species are discussed in this section.

241 A great diversity of introduced species are commonly
137 found in cropping sequences and secondary vegetation
associations on the island. The groups of plants that will
128 be discussed include: important staple and commercial crops;
supplementary food plants; important non-food plants;
important tree species; and common weed and secondary
vegetation species. A comprehensive listing of these
plant species and their uses is found in Appendix E.[A]

241 Important Staple and Commercial Crops

Staple food plants and commercial crops are the most important crops on bush allotments in terms of total acreage and include the following species:

244 [439] The greater yam - '*ufi* (*Dioscorea alata*). The greater yam is traditionally the most prestigious of Tongan subsistence crops as well as being a minor export crop. Its center of origin is believed to be tropical Southeast Asia (Herklots, 1972: 418). It is known only in cultivation and was introduced prior to European contact. Numerous kinds of yams are recognized by Tongans; Whitecomb (1930: 19-20) listed 114 different kinds. The major kinds now cultivated are the *kahokaho* (which is considered the best and most prestigious), *kaumeile*, *maho'a'a*, *kulo*, *kivi*, *takulevu*, *voli*, and *tamuni*. Yams are generally planted from May through December, take six months to one year to mature depending on the variety or desired size, and are

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[A] [See Category 137, pp. 377-431--Analyst.]

244 and beets - pitiluti (Beta vulgaris), all native to Europe or the Mediterranean; lettuce - letisi (Lactuca sativa) and bulb onions - onioni Palangi (Allium cepa), both native to the Middle East; cucumbers - kiukamipa (Cucumis sativus) and eggplant - paigani (Solanum melongena), both native to India; Chinese cabbage - kapisi Siaina (Brassica chinensis and B. pekingensis), native to China; and radishes - latisi (Raphanus sativus), native to Europe and Asia (Herklots, 1972). Most of these are grown infrequently, and are generally in season at the same time as [438] tomatoes and bell peppers. The seeds are purchased primarily from large trading stores.

245 Vanilla - vanila (Vanilla planifolia). Native to [439] Mexico (Macmillan, 1956: 330), vanilla has been successfully introduced into Vava'u where it has now become an important export crop. Within the past few years, a small number of Tongatapu farmers have also planted vanilla on their bush and town allotments. It is generally planted using the physic nut or fiki (Jatropha curcas) to climb on. As of yet, it is of little or no economic importance on Tongatapu.

241 Supplementary Food Plants

In addition to staple food plants and commercial crops, there are a considerable number of supplementary, non-arborescent food plants commonly grown on bush and town allotments throughout Tongatapu. These crops include: 000

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262 Teve (Amorphophallus campanulatus). This traditional Pacific aroid, although supposedly eaten as a starch in the past, is rarely if ever eaten and is found only occasionally in a wild state on bush allotments.

241 Other miscellaneous food plants. There are a number of other, introduced food plants which are grown on an infrequent basis, primarily on town allotments, such as roselle - lasipeli (Hibiscus sabdariffa).

Important Non-food Plants

There are a considerable number of important non-food plants (not including large trees), which are also commonly found on bush and town allotments throughout Tongatapu; these include:

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287 Paper mulberry - hiapo (Broussonetia papyrifera). Of East Asiatic origin and ancient introduction into the Pacific (Yuncker, 1959: 97), paper mulberry is traditionally one of Tonga's most widely grown, non-food plants, its fibrous inner bark being used to make tapa cloth or ngatu. 248 It is grown on a large number of bush allotments throughout Tongatapu, either alone or intercropped with other subsistence crops. It takes about 12 to 18 months to mature, can be cut continuously for a number of years and is often found in bush fallow associations where it remains useful for the production of tapa cloth.

247 Screwpine (Pandanus spp.). Although commonly found growing naturally throughout Tongatapu, there are a number

136 rattus), the Norwegian rat (Rattus norvegicus), as well as
231 cats, cattle, horses, goats, sheep , turkeys, ducks, and
possibly insects such as the rhinoceros beetle (Oryctes
rhinoceros) and fruit flies were introduced after European
231 contact. Dogs, cats, pigs, cattle, horses, goats, chickens,
ducks and turkeys are presently important domesticated
136 animals. There are presently no sheep in Tonga. Rats have
become naturalized, and cats and chickens are represented
by feral stock; there were formerly also feral pigs.

The fruit bat or peka is nocturnal and feeds almost
exclusively on fruit such as bananas, mangoes, and papayas.
Although the fruit bat population is increasing, the
[262] problem is not considered serious. Furthermore, the peka
[565] provides an excellent source of protein, which, although
supposedly reserved as a delicacy for the nobility, is
eaten occasionally by commoners.

[241] Rats constitute a major nuisance and cause consider-
245 able damage to a variety of crops. Owing to the economic
136 importance of copra, most of the research concerning rat
damage has been focused on its effect on coconut production.
Estimates of loss in coconuts have ranged up to 80 percent.
Recent studies, however, indicate that this is a gross
overestimation and that loss of yield in any individual
stand of coconut palms is rarely over 10 percent (Pierce,
1971b: personal communication). Rattus rattus comprised
80 percent of all rats trapped in coconut palms during the

245
136 recent survey (Pierce, 1971a: 4).

136 *Rattus exulans* and *R. norvegicus* seem to be less
241 arboreal and, according to a recent survey by Agricultural
Department personnel, account for most of the rodent
damage to ground crops. The common field mouse (*Mus*
musculus) may also be present and responsible for crop
damage (Pierce, 1971b: 1). Results of this survey indicate
that rodent damage to watermelons often reaches 30 to 50
percent of the total crop; damage to maize is commonly 30
to 60 percent with 90 percent losses in severe cases; and
peanuts, sweet potatoes, and cassava all sustain some
damage. *Rattus norvegicus* seemed to be more common than
R. exulans in most habitats. (Pierce, 1971a: 2-4) The
author has also observed severe rat damage to all of these
crops as well as to papaya and pumpkins.

Native birds are responsible for high losses of crops
such as corn, strawberries, papayas, mangoes, and *tava*
(*Pometia pinnata*). Two species which are particularly bad
pests are the banded rail (*Rallus philippensis*) and the
136 purple swamp hen (*Porphyrio porphyrio*). Birds also seem
137 to be the major dispersal mechanism for *Carica papaya* and
Cordyline terminalis as well as weedy species such as
136 *Lantana camara* and *Psidium guajava*. The native barn owl
(*Tyto alba*) probably has some limiting effect on the rat
136 population. Although the combined effect of domesticated
241 and feral stock, bats, rats, and birds is considerable,

136 241 the effect of the invertebrate fauna on the agricultural system is probably of greater significance.

136 245 Two of the most destructive pests are the rhinoceros beetle (*Oryctes rhinoceros*) and the coconut stick insect (*Graeffea crouani*), which have been responsible for substantial losses in coconut production. The rhinoceros beetle, which was first discovered on Tongatapu in December, 1961, possibly carried by man from Vava'u, has been the object of extensive, although as yet unsuccessful, control programs. The coconut palm is also affected by other insects including the coconut flat moth (*Agonoxena spp*), and the coconut leaf miner (*Promecotheca spp.*).

Considerable damage to bananas is caused by the banana scab moth (*Nicoleia octasema*), the banana rust thrips (*Chaetanophothrips orchidii*), the nematode (*Rodopholus similis*), fruit flies (*Atherigona orientalis* and *Dacus faciatus*), and indirectly by a species of aphid (*Pentalonia nigronervosa*) which is responsible for the spread of bunchy-toptop virus (O'Connor, 1969). 136 241 [439] Fruit flies are also a problem in production of tomatoes and bell peppers, and have made Tongan citrus fruit unacceptable for the New Zealand market (Johansson, 1971: personal communication). Other invertebrates, such as leaf miners, moths, spider mites, and weevils, also cause damage to crops throughout Tongatapu.

Plant Diseases

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Considerable damage is caused to crops by bacterial, fungal and viral infestations. The black-leaf-streak, *Mycosphaerella sp.*, and the bunchy-top virus have severely reduced commercial as well as subsistence banana and plantain production on Tongatapu. Apart from damage to these crops, subsidiary commercial crops such as watermelons, pineapples and garden vegetables, and important subsistence crops such as yams, sweet potatoes, manioc, and taro are also adversely affected.

642
648 appointment of Europeans to high Tongan government positions (Wood, 1945:62).

643 Since 1905, the Tongan government has, with British guidance, functioned without major problems. After the death of Tupou II, his daughter, Queen Salote Tupou III, reigned from 1918 to 1967, at which time she was succeeded by her son, the present king, Taufa'ahau Tupou IV. In 1958, 642 648 a new "Treaty of Friendship" with Great Britain (ratified in 1959) gave the Tongan government increased freedom and, finally, in June 1970, Tonga obtained complete independence, at the same time becoming a member of the British Commonwealth.

177
241 Throughout Tonga's history, the exposure to other cultures and their technologies has had considerable effect on the agricultural system. Contacts with other Pacific Island cultures such as the Fijians and Samoans encouraged trade, which put both social and economic value on Tongan products. These contacts also led to the introduction of various cultigens and animals that are now important components of the agricultural system.

[231] The early European navigators and explorers exposed Tongans to firearms and other European technology, and Cook introduced new cultigens and domesticated animals: melons, pineapples, pulses, cattle, sheep, horses, rabbits and deer (Beaglehole, 1967:120 and 1969:262). 177 Further contact with whalers, trading vessels, runaway sailors, and escaped

177 convicts also increased the Tongans' knowledge of the
European culture. These visitors searching for whales,
sandalwood, turtle shell, bêche-de-mer, cheap labor, and
adventure, introduced new diseases, alcohol, and firearms.

177 The impact of missionary societies effectively began in
797 1826 and was dominated by the Methodist or Wesleyan Mission
[795] although Catholic, Anglican, Seventh Day Adventist and,
more recently, the Morman missions have also had consider-
[241] able influence. Tongans have been nominally converted to
Christianity; an education system was founded; there has
been considerable missionary influence politically; and new
agricultural technology such as sprinkler irrigation and new
varieties of peanuts, bananas, garden vegetables, and other
crops have been introduced through missionary societies.

177 During the latter half of the nineteenth century, resi-
439 dent traders and large trading concerns, such as J.C.
Godeffroy and Son, came to Tonga for such products as coco-
177 nut oil and bêche-de-mer (Robson, 1946:63). European
241 settlers and trading companies, such as the successor to
439 Godeffroy and Son, the D.H.P.G. (Deutsche, Handels-und
[423] Plantagen-Gesellschaft der Sudsee-Inseln zu Hamburg),
obtained leasehold rights to land and developed plantation
agriculture around copra, cotton, coffee, and livestock. A
number of these large-scale plantations still exist, and
European technology and the cultivation of export crops have
remained an integral part of Tongan agriculture.

178 After the supplementary Treaty of Friendship with Great
241 Britain in 1905, the mercantile functions of the traders
654 were reduced gradually and the Tongan government, with
[177] British guidance, assumed greater responsibility for
[647] economic and agricultural activities. Major moves to "Tonganize" or localize the commercial agricultural economy included: the appointment of an agricultural advisor in 1901 and a Director of Agriculture in 1939 (Maude, 1965:43-44); the formation of the Tonga Copra Board in 1942; and the formation of the Tonga Banana Board (now the Tonga Produce Board) in 1949.

177 The Tongan culture was strongly affected by the Second World War when Tongatapu became a staging area for shipping
[368] wartime supplies. Roads, wharves, a railroad, and the present airport at Fua'amotu were constructed. Of even greater consequence, the Tongan people received additional exposure to the workings of the cash economy as well as an introduction to an almost entirely new set of values, which differed radically from those of the missionaries and the elitist colonial administrators.

177 There continues to be a steady stream of temporary non-
167 Tongan administrators, teachers, technical experts and volunteers primarily from Britain, New Zealand, Australia, and, more recently, the United States of America, who continue to have an effect on the Tongan culture in spite of the current wave of Pacific Island nationalism and search for self-identity.

842 definite barriers to the success of family planning in
Tonga. One of the foremost is the cultural desirability of
163 having large families. The average fertility rate, based
on the study, was estimated at 7.3 births per woman (Wolff
000 and De Sarmo, 1970:6-23). Even if the birth rate were
reduced to two per cent per annum, the Kingdom's population
in 1996 would be close to 150,000, with over 100,000 on
Tongatapu; the population density for Tongatapu would then
be over 1,000 people per square mile (386 per square kilometer) or approximately 17.7 persons per bush allotment
(based on the present number of 5,652 bush allotments on
161 Tongatapu). The estimated population density for Tongatapu
at the time of this study in 1971 was 626 persons per
square mile (about 242 per square kilometer) or about 10.4
000 persons per bush allotment. Such a population increase
will inevitably change the existing agricultural system
through a shortening of fallow periods and a reorientation
241 of cropping practices and plant selection. Incipient
182 changes are already taking place with the supplanting of
yams, bananas, and taro as the main subsistence crops by
manioc, which has a shorter growth period and will continue
to produce high yields when planted repeatedly on the same
000 plot. Finally, there will be further increases in the
number of landless Tongans who will have to look for employment outside the agricultural sector.

361 one-eighth to 15 acres instead of the customary town and
659 bush allotment. The scheme has met with only moderate
423 success.

361 The shift from dispersed to nucleated settlement has
178 led to the transfer of many fruit trees and other specialty
241 crops, such as medicinal herbs, kava, and sugar cane, to the
dooryard gardens on the town allotments.

563 Ethnic Composition

Tonga, unlike most Pacific Island areas, has never had
[162] a large Asian or other foreign component. Census figures
show the Tongan component representing over 98 percent of
the total population and over 97 percent of the population
[423] on Tongatapu (Table 8). A few non-Tongans have leasehold
rights to land, but only Tongans have the legal right to
tenure on the traditional town and bush allotments to which
this study is directed.

162 Age-Sex Structure

[464] Like most countries with high population growth rates,
the Tongan population has a very high proportion of young
people, many of whom are not gainfully employed. In 1966,
60 percent of the population was under 21, slightly more
000 than in 1956. As these people begin families and look for
employment either as farmers or wage earners, more pressure
will come to bear on the present agricultural system.

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Social Structure

Tongan social structure is permeated by countless

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Table 12. Sample households having access to a specified number of Bush Allotments.

Village	Bush Allotments per Household					Total	Total
	0	1	2	3	4 or more	House holds	Allot ments
Haveluliku	0	7	1			8	9
Fatumu	0	11	3	2	2(4,5)	18	23
Kolonga	0	18	3	1	1(7)	23	34
Houma	1	12	5		1(5)	19	27
Kolovai	0	13	2			15	17
Ha'ateiho	3	18	1			22	20
Kolomotu'a	22	9	1			12	11
Kolof'ou	10	15	1			26	17
Ma'ufanga		7				7	7
TOTAL	16	110	17	3	4	150	174

*Numbers in parentheses indicates the actual number of allotments if 4 or more.

(Source: Survey questionnaire data.)

423 Although a great majority of the households have some
241 access to bush and town allotments, the type of agriculture
182 practiced on these allotments is affected by the nature of
423 tenure. There are essentially four basic types of tenure.

000 423 241 an allotment. The more permanent the tenure, the greater the possibility that the tenant will plant long-term crops like coconuts, bananas, or other fruits trees instead of subsistence crops like cassava or taro.

423 425 The most common means of obtaining legal or customary tenure to a bush or town allotment is inheritance. [428] Individuals who are not legal heirs must find vacant allotments. By law, an individual, after finding a vacant allotment should apply directly to the Minister of Lands to register it. Unfortunately, in practice a person generally must first get approval from the estate holder in the case of an hereditary estate, or the town officer, in the case of government or Crown land. Although the Minister of Lands can overrule the decision of either the estate holder or the town officer, this rarely happens.

[571] An individual who wants permission to register land seldom approaches the estate holder or town officer directly; instead, he works through senior kinsmen or a matapule [431] with higher social standing. In almost all cases, inquiries are either preceded or accompanied by gifts of food such as pigs, chickens, or yams. If permission is given, the new "holder" will, in most cases, not be able to register the allotment immediately. Instead, there is generally a "probationary" period designed to insure that new holders use the land wisely and fulfill their social obligations to [427] the village or district(Maude,1965:104). The probationary

423 period is often abused or extended by the estate holder or
425 town officers who make excessive demands on the tenant.
[427] Thus some estate holders in effect have the same power
over land distribution as they had prior to the "emancipa-
[565] tion" of landholders in 1852. At present, there are a
[427] number of nobles who have bad reputations, with respect to
demanding foodstuffs, labor and money, while failing to
register allotments. In most cases, it is easier to
register an allotment on Crown land than on an hereditary
estate.

[428] Occupancy by customary right is generally obtained
through inheritance and is relatively secure, especially if
a family has used a particular allotment for generations.
Rulings by the Land Court have commonly favored a customary
holder over a registered holder who has obtained approval
[427] of the estate holder (Hunter, 1963:104-106). Nevertheless,
under customary tenure, there is a greater incidence of
having to fulfill obligations to the estate holder. However,
where the estate holder or officer is not excessively
demanding, customary tenure is for practical purposes as
secure as legal tenure.

Temporary tenure is obtained by asking kinsmen, friends,
[241] or even estate holders for usufruct rights. In this case,
the legal or customary holder generally produces copra
from the palms on the property, while the tenant plants
only subsistence crops. Owing to the scarcity of vacant

423 allotments, some households and many individuals have only
425 temporary tenure. They are generally younger brothers who were not legal heirs or are immigrants from other islands or districts. The ability of an individual or household to obtain temporary occupancy seems to be, to a great extent, contingent on fulfillment of social obligations.

423 Finally, it is not uncommon to find landholders rent-
425 ing their land to others, although strictly forbidden under
427 law. An increasingly common practice seems to be rental to
[241] farmers who want additional acreage for commercial crops,
such as bananas, watermelons, and garden vegetables, or for
[435] yams to be sold locally. The rental fee for an eight and a quarter allotment ranges from as low as five to over a hundred dollars per year or a percentage of the profits. The period of rental usually runs from one to five years. It depends on the individual agreement whether the tenant has usufruct rights to coconuts planted on the allotment. Many Tongans who are willing to rent all or part of their allotments are wage earners rather than full-time farmers.

Tables 14 and 15 show the nature of tenure to bush
423 and town allotments for the sample households on Tongatapu.
[369] The highest percentage of registered allotments are in the
[161] urban area of Nuku'alofa(Kolomotu'a, Kolofo'ou and Ma'ufanga)
and Kolovai, both areas with high population densities and smaller parcels of land. Similarly, in Kolonga, one of the first areas to be resurveyed according to the Cadastral

423 Survey of 1957, the estate holder has allowed a relatively high percentage of the allotments to be registered.

The area with the lowest proportion of registered allotments is around Fatumu and Have'uliku, where subdivision has not been completed and tenure to many parcels is on a customary basis. There seems to be little significant difference in the percentage of households having only temporary tenure, except for Kolonga, where the percentage
[311] was 35. Kolonga is one of the major banana growing areas,
[245] as well as being well-organized on a village basis for production of cash crops. Likewise, out of seven allotments
[427] which were rented, five were in the Kolonga district, where successful local enterpreneurs have rented allotments from other villagers.

[592] In summary, although the number of allotments in Tonga is insufficient, most households have some access to land,
241 either permanently or temporarily. Futhermore, although
311 strictly forbidden by law, renting land to those who are
423 landless or industrious enough to farm more land often
427 intensifies utilization of the land that is available.
241 Because of varying permanency of tenure, different kinds of
311 cropping, ranging from almost purely subsistence gardening
423 to purely commercial agriculture, occur throughout the mosaic-like patterm of over 5,000 bush allotments. The permanency of tenure of town allotments is also often reflected in the degree to which trees and long-term crops

423 are planted in dooryard gardens. Because the law which
311 requires that the allotments be kept in a reasonable state
241 of cultivation is not enforced, many allotments are under-utilized or have not been used for extended periods of
423 time. These allotments are often held by wage earners, "in trust" for sons who are too young to utilize the allotments, or by individuals who have left Tonga to work or reside overseas.

Table 14. Class of tenure to bush allotments held by sample households.

Village	Registered	Un-Registered	Temporary	Rented	Total
Haveluliku	3	4	2	0	9
Fatumu	3	23	6	0	32
Kolonga	15	2	12	5	34
Houma	9	12	5		27
Kolovai	11	2	4	0	17
Ha'ateiho	10	6	3	1	20
Kolomotu'a	6	3	2	0	11
Kolofo'ou	13	1	36	0	17
Ma'ufanga		1	1	0	7
TOTAL	75	54	33	6	174

463 around their own households, including preparation of
462 agricultural crops and handicrafts, and working in dooryard
162 gardens or on the bush allotments.

463 A high percentage of Tongan males employed in agriculture is also shown by the survey of households conducted by the author in 1971 (Table 17). These data show a majority were full-time farmers and that another 15 percent had some other employment, such as a village storekeeper, part-time banana inspectors/or a lay preachers, but still considered themselves primarily farmers. Out of 149 households, there were 39 households with more than one full-time farmer (one household with five; two with four; eight
[461] with three; and 28 with two). Of the 36 heads of households who considered themselves full-time wage workers, 58 percent put in some time, ranging from 1 1/2 to 16 hours per week farming on their allotments. Of these 36 full-time wage earners, five did not own allotments.

262 Subsistence Needs

241 The Tongan diet continues to be largely dependent on
staple and subsidiary crops grown on traditional garden
262 allotments. In a listing of the relative importance of
439 items in the diet (Table 18), only a few imported items
128 such as bread (made from imported ingredients), mutton,
[263] and canned fish rank high on the list. Imported luxury items
used more for flavor than nutrition, such as canned fruits,
gelatin desserts, ice cream, sugar, salt, and canned or
dried milk, are not listed.

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dried milk, are not listed. Furthermore, despite increasing imports of cosmetics, medicine, tea, coffee, soda pop, alcoholic beverages, and tobacco products, the Tongan agricultural system continues to be the major source of traditional medicines, perfumes, oils, soap subsitutes, ingredients for beverages (including alcoholic "home brew" or hopi and the traditional social beverage kava), as well as being a source of tobacco, vegetable dyes, fish poisons, and other miscellaneous necessities (see Appendix F).A

463 Table 17. Occupations of heads of households for sample households on Tongatapu.

	Outside Nuku'alofa		In Nuku'alofa		Tongatapu	
	No.	%	No.	%	No.	%
Full-time Farmer	64	61	15	34	79	53
Part-time Farmer	17	16	5	11	22	15
Full-time Wage Worker	13	12	23	52	36	24
Unemployed	11	11	1	2	12	8
TOTAL (Sample)	105	100	44	100	149	100

A[Author probably means Appendix E; see Category 137, pp. 377-431--Analyst.]

000 Tongan men and women. Wild or cultivated *Pandanus* leaves,
291 coconut fronds,and stems of wild plants such as *Hibiscus*
824 *tiliaceus* or *Eleocharis dulcis* are sources of fiber from
287 which the various types of *ta'ovala* are made. The tapa
248 cloth or *ngatu* is prepared from the inner bark of the
paper mulberry plant (*Broussonetia papyrifera*), which is
291 planted as a crop in the bush gardens. Belts or twine used
824 to hold the garments in place are often made out of either
coconut or *Hibiscus* fiber.

342 In the case of housing or shelter, the role of the
241 agricultural system is again of considerable importance as
342 a source of materials. Table 19 is an enumeration of
128 housetypes found as part of the survey of 192 allotments on
Tongatapu. Although it is often difficult to distinguish a
342 "small wooden" house from a "large wooden" house, there is
no doubt that almost half of the major dwelling units are
342 of the traditional thatched variety(*fale Tonga*). A *fale* is
824 constructed with plaited coconut fronds for walls and roofing;
coconut and other local timber for poles, beams
and framework; and coconut fiber and the inner bark of
Hibiscus tiliaceus for lashing and tying the roofing down.
In some cases, varieties of bamboo (*Bambusa* or *Miscanthus*)
are used for walls. The leaves of a type of sugarcane, *au*,
are used in the construction of a superior and long-lasting
thatched roof. Even wooden houses are often constructed
partially or entirely from local timber.

342 partially or entirely from local timber.

Table 19. Frequency of specified house types in the sample of 192 Tongatapu town allotments (some allotments had more than one family dwelling).

Village	Large Wooden	Large Brick	Small Wooden	Tongan Fale	Number of Houses
Nuku'alofa	71	11	19	56	157
Fo'ui	7	1	0	11	19
Niutoua	7	0	2	4	13
'Utulau	1	1	1	3	6
Tatakamotonga	9	2	2	14	27
Fua'amotu	4	0	0	10	14
Urban	71	11	19	56	157
Non-Urban	28	4	5	42	79
TOTAL	99	15	24	98	236

241 The agricultural system also provides numerous household accessories, tools and utensils, traditional exchange items, and attire for ceremonial or social occasions (Appendix E). A

Monetary Needs

434 Much of the average Tongans' cash income comes directly or indirectly from the agricultural system. In the sample survey of 141 households, most sold coconuts or

A [See Category 137, pp. 377-431--Analyst.]

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Table 20. Continued.

Other sources	5%	16%	9%
Total sample size	97	44	141

434 The great diversity of store goods which are now desired by the average Tongan family (Tables 21 and 22) emphasizes the growing need for cash. In addition, cash is needed for church, school fees, taxes,and to fulfill social obligations within the family, the village, and to nobles or even to the town officer in some cases.

439 Overseas Income

[241] The primary source of Tongan overseas income is the agricultural system. During the period from 1967 to 1971, products of agricultural origin constituted 97 percent by value of all exports(Table 23). The remaining 3 percent included re-exported motor vehicles, empty containers such as oil drums and gas cylinders, goods under bond, and personal effects. [431 602] A small proportion of the total value of exports is made up of agricultural products sent by Tongans as gifts to relatives overseas, including yams, taro, bananas, watermelons, sugar cane, mangoes, kava, pineapples, and handicrafts. Such items fulfill social obligations and indirectly account for considerable income in the form of remittances from the (grateful) recipients of the goods.

434 **Table 22. Continued.**

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Table cloth	**1**	**Fertilizer**	**1**

439 The fungus, Auricularia polytricha, which is exported
137 to Hong Kong, is classified as an agricultural product by
824 the Tongan Government, and although most of it comes from
the island of 'Eua, some is still found during rainy periods
on dead logs in forested areas of bush allotments on
Tongatapu.

439 At present there is a concerted effort being made by
179 the Agricultural Department and the Tonga Commodity Boards
652 to diversify and increase agricultural exports in order to
179 stabilize the economy. Those efforts have increased
241 production of garden vegetables, pineapples, watermelons,
root crops, and, more recently, vanilla. ~~Nevertheless,~~
439 the major export crops continue to be coconuts and bananas.
245 Unfortunately, the market for copra is highly unstable,
and both crops are susceptible to disease, pests, hurricanes,
[505] and periodic droughts. In the case of bananas, exports
depend on unreliable shipping services to New Zealand.
Nevertheless, coconuts and bananas are still the major
commercial crops found on the traditional bush allotment.
Consequently it is important to have some background on the
production of these crops.

Copra and Other Coconut Products

Prior to World War II independent traders throughout

[TEXT CONTINUED ON PAGE 156]

245 subsidies for adequate maintenance of the young trees, and 654 many new palms have been killed as a result of burning, [244] competition by weeds, or trampling by horses or cattle. The fertilizer is often diverted to other crops, such as watermelons or European vegetables. The palms generally are poorly cared for and many allotments are not planted with [262] sufficient palms to obtain maximum yields. Nevertheless, the fact that most allotments do have mature coconut palms, and some have replanted palms, reflects their importance not only as a source of cash but also as a major staple item in the Tongan diet.

241 **Bananas and Other Commercial Agricultural Exports**

439 The other export crop, bananas, along with commercial watermelons, pineapples, and garden vegetables, have also become integral parts of the cropping sequences on bush [655] allotments. In 1940, bananas, watermelons, pineapples, and a number of other products were declared "commodities" under the Agricultural Organization Act and have since been marketed only through the Tonga Produce Board (Wylie, 1967: 1557-1563).

245 439 Bananas became an important export in the first decade of the century. In 1908, over 100,000 cases were shipped to New Zealand at a value of $T28,000. In 1909, however, New Zealand trade restrictions caused a considerable decline in the export of bananas. This decline lasted until 1931 when a satisfactory trade agreement was reached (Naval Intelli-

245 banana plantations. Nevertheless, the banana industry
[439] continues to be a major source of cash income to the Tongan
farmer, and the 8 1/4 acre bush allotments continue to be
the major suppliers of bananas to the Produce Board for
shipment to New Zealand.

313 One important effect of the increase in banana
production in the 1960's was the need for locally produced
banana cases which put considerable pressure on the timber
resources of Tongatapu as well as 'Eua and Vava'u. In fact,
by 1968, the timber resources on Tongatapu had been reduced
to such an extent that milling ceased and was shifted to
'Eua (Government of Tonga, 1969a:16).

241 There has been a continuing attempt by the Tonga
439 Produce Board and the Tongan Government to diversify export
655 crops and broaden Tonga's agricultural base. In the case of
watermelons, pineapples, plantains, tomatoes, and bell
peppers, which are exported through the Produce Board, the
241 results have been quite encouraging. Some crops are also
439 presently being shipped through independent marketing
[441] agencies to New Zealand, Fiji, Samoa, and the United States.
These include mangoes, tomatoes, bell peppers, egg plant,
green beans, ginger, yams, taro, and sugar cane. The export
values for these products for the five year period from
[441] 1967 to 1971 are included in Table 23.[A] Most of these independent exporters are individuals or church or missionary
societies, holding leasehold rights to large tracts of land

[A] [See Category 439, pp. 152-155--Analyst.]

241 439 on which the bulk of their exports are grown.

[441 655] Most export produce is, however, shipped through the
Produce Board, and a great percentage of this is grown on
the individual bush allotments. Vanilla, which is an
important export crop in Vava'u, is now being grown in the
Ha'apai group and on Tongatapu. Experimental export of
cantaloupe (rock melon) and strawberries have also been
made, and schemes to export onions, garlic, and corn to Fiji
242 439 are under consideration. In 1971, to encourage the production of other export crops, a laboratory was established
and manned by a trained plant pathologist to study diseases
and insects that are prevalent in the Kingdom.

443 Domestic Agricultural Income

The market place in Nuku'alofa, which began as a collection of periodic street vendors after World War II, evolved into a modern open-air facility known as Talamahu Market, which officially opened in October 1970. The market takes up four acres (1.6 hectares), contains 47 lock-up stalls, 80 tables, considerable floor space for additional sellers, toilets, taxi stands, and a bus depot.

443 438 The market deals primarily in native subsistence produce, mainly staple crops, vegetables, and fresh fruit. It also handles a limited amount of native fiber goods, tapa cloth, native medicine, beverages, spices, and more recently handicrafts. Some prepared food, firewood, shellfish, live pigs, and chickens are also sold outside the walls of the

443 438 market. Exchange is generally on a cash basis.
[436] The market is open every day except Sunday, Saturday
having the heaviest trading. On one Saturday, an estimated
350 sellers were present and approximately 2,000 buyers, who
443 purchased about $T3,000 worth of produce. Including non-
buyers and socializers, people present may have totalled as
many as 5,000 or approximately ten percent of Tongatapu's
443 population. A great variety of agricultural products are
438 sold at the market (Table 27). Some items such as rhubarb,
● [244] okra, parsley,and certain varieties of squash are marketed
[241] solely by well-organized truck gardening operations,
[795] including the Mormon Church, but most items are grown
primarily on bush or town allotments. Most sellers are part-
443 time or target marketers, who sell only when they have
surplus agricultural products or are in need of cash for a
[441] specific purpose. The balance of the sellers, no more than
25 percent, are either representatives of co-operative
societies and missionary societies or middlemen who buy
products from individual farmers and serve as retailers.

443 In short, the market is: 1) a source of cash for rural people;
438 (90 percent of the sellers in the market during a study on
January 22, 1972, were from outside Nuku'alofa); 2) an
important food source for the increasing urban/non-agrarian
population of Nuku'alofa (approximately 85 percent of the
food purchased was purchased by consumers in the Nuku'alofa
area); 3) an important source of firewood, Tongan medicine,

[TEXT CONTINUED ON PAGE 174]

443 The sale of Tongan handicrafts is also a major source
438 of domestic cash income. Handicrafts, which include items
such as tapa cloth, pandanus mats, pandanus and coconut
443 leaf baskets, seed necklaces, flower leis, and wood carvings
438 are sold through a Tongan woman's co-operative marketing
439 organization, the Langa Fonua, at Talamahu Market and other
441 locations in Nuku'alofa, in special stalls set up on the
485 government commons on days when passenger liners are in
port and select locations near points of interest to sight-
443 seers throughout Tongatapu. Although some handicrafts are
438 exported to Fiji, New Zealand, Australia, American Samoa
439 and the United States, more are sold locally.

Labor Organization

241 Out of 126 sample households with bush allotments,
461 there were 198 males whose primary occupation was working
on these allotments. The average work per week was 23 hours
241 per man and 36 hours per household. Although these men
476 mostly worked as individuals or with family members in small
[461] groups, the figures also include the hours of work in
organized communal groups or as wage laborers on agri-
cultural allotments. For tasks such as clearing bush,
planting crops, harvesting, making tapa, or building houses,
many Tongans prefer to work in communal groups rather than
as individuals or households.

[621] The most common working group is known as the *kautaha*

241 or kautaha toungaue, generally based on village residence or
476 in some cases on church or family ties. Of 126 households
[621] sampled on Tongatapu, 33 heads of household belonged to
241 kautaha toungaue. All of these 33 households were in
476 villages outside Nuku'alofa. Of 31 households in Nuku'alofa
369 no head of household belonged to a kautaha. This probably
[621] reflects urban breakdown of "village solidarity" which
241 provides the main basis for membership in these groups. The
476 number of members ranged from 2 to 15 with the median being
241 7 members. The average number of days worked per week was
476 4.9. Some kautaha's work only during the yam harvesting
461 planting and cultivating seasons from January to September,
but most work throughout the year.

241 The kautaha works on the allotments of its members in
476 rotation. If a member misses a working day, the kautaha
[686] either charges him the going rate of 20 cents per hour for
the time he has missed, skips his allotment during that
241 rotation cycle, or in some cases does not penalize him. The
476 number of allotments worked on per day ranges from one to
461 four with a median of two. The number of hours worked on
each allotment ranges from one to eight with an average of
3.6. The total hours per day worked by a kautaha averages
241 8.1 with a median of 6. The major tasks performed by the
476 kautaha toungaue include clearing bush, burning, planting,
weeding, and harvesting.

[425] Another temporary communal work group is the toutu'u

241 'ufi, which is generally formed for the purposes of
476 planting yams and other staple root crops on a plot of land
[425] donated by or rented from the holder. Whereas the village
[621] tends to be the primary basis for membership to the kautaha
[794] toungaue, the church is of almost equal importance in the
case of the toutu'u 'ufi. Certain procedures are generally
followed by the toutu'u 'ufi. Each member is allotted a
predetermined number of rows of yams, using planting
material that he supplies individually. The work, which
includes tasks such as clearing the land, planting, weeding,
and harvesting, is all done as a group. After the yams are
harvested, taro and paper mulberry are commonly planted,
with manioc, bananas, or giant taro being planted occasionally.
In only two cases out of 48 sample toutu'u 'ufi was
the land fallowed after the yam harvest. A common occurence
after the yam harvest is the cultivation of paper mulberry
by communal women's groups (toutu'u hiapo) for use in making
tapa cloth. Out of 142 households, 34 percent participated
in toutu'u 'ufi in 1970-71, whereas 51 percent had participated
[369] in toutu'u 'ufi in the past five years. There was
little difference between town and bush areas, with 29
percent and 36 percent of the heads of households, respectively,
having participated in toutu'u 'ufi. Membership in a
given toutu'u 'ufi ranged from 2 to 40 with a median of 7
members.

A limited number of households, 13 out of 138, also

241 indicated membership in other planting organizations, most
476 of which required members to plant bananas, yams, and other
crops on their own land, in accordance with a pre-determined
quota. To insure that the crops are planted and well-maintained the members periodically inspected each member's
allotment.

Another form of kautaha is the kautaha le'o vao; its
main purpose is to patrol bush allotments to prevent theft
of agricultural products, especially coconuts for making
[184] copra. These groups seem to be much more prevalent in the
[464] Ha'apai group and only four households of the Tongatapu
sample of 138 households indicated membership, while 9
indicated that they paid kautaha to patrol their allotments.
[465] The payment is generally a small amount of cash or mature
241 coconuts. In most cases, the villagers on Tongatapu seem to
be content to look after their crops themselves.

241 There are also many households who pay independent
464 kautaha ngaue to work on their allotments. These paid
kautaha serve a similar function to the kautahe toungaue
and are often hired when large amounts of labor are needed.
Of 140 sample households, 33 percent had paid others to work
on their land during 1971.

476 Women's communal work groups are also common and
287 include the koka'anga, the toulanganga, and the toulalanga.
The koka'anga and the toulanganga both function in the
preparation of tapa cloth. The koka'anga is performed when

476 most cases, these tasks are performed in the spirit of community service with the beneficiary of the work generally supplying food and drink to the workers.

● 241

Technology

Tongan agricultural technology relies primarily on human labor with no plow animals and only limited mechanization. 241 The average Tongan gardener still uses simple hand 412 tools that replaced the traditional digging stick over a century ago. As early as the 1850's, it was mentioned that in the preparation of soil for yams "the earth is completely dug out of these pits, by aid of small iron huos or narrow lance-shaped spades, attached to a long wooden handle..." (West, 1865:136). The major tools that are used by Tongans today include: cane knives or machetes (hele pelu), owned by 99 percent of 141 sample households; sharpened digging spades with heavy wooden or pipe handles (huo keli), owned by 88 percent of all sample households; flattened spades with broad hoe-like heads (huo lafalafa) used for weeding and clearing grass, owned by over 94 percent of the sample households; axes (toki palangi), owned by 74 percent of the sample households; steel digging forks (huo langa), owned by 61 percent of the sample households; small coconut knives (hele hihi niu), used to pry coconut kernel from the shell, owned by 43 percent of the sample households; garden rakes (leiki) owned by 15 percent of the sample households; and

241 metal adzes (*toki Tonga*), owned by only 2 percent of the
412 sample households. In the cases of machetes, *hele pelu*,
and the two most important spades, the *huo keli* and the *huo*
[369] *lafalafa*, many households owned more than one of each. Rakes
[247] and shovels are commonest in the urban area of Nuku'alofa
where ornamental gardens are more prevalent.

241 Using only these implements, most Tongan farmers cut
down the bush or forest vegetation and after burning the
accumulated plant material after drying, prepare the land
for planting, plant, weed, and harvest the different crops.
241 An increasing number of farmers, however, are beginning to
407 use the tractor-pulled plow and disc-harrow and, although
654 only one out of 141 households owned a tractor, 53 percent
have had their allotments plowed at one time or another,
mostly by the Coconut Replanting Scheme or the Agriculture
Department for planting new coconuts or other export crops.
241 Of the 140 households interviewed, 43 percent felt that
plowing was good for the soil, 44 percent felt that it was
bad and caused the soil to become infertile, 13 percent had
241 no opinion. Regardless of the feeling of the average Tongan
654 the Agriculture Department, the Coconut Replanting Scheme,
and the Produce Board have been advocating the use of the
plow rather than burning the dried vegetable matter.
[492] Although the Agriculture Department has experimented with
draught animals for plowing, Tongans have never adopted
this practice (Government of Tonga, 1952:3).

241 For commuting between the bush and town allotments and
481 transporting agricultural produce, the commonest modes of
494 transportation are walking, riding horses, horsecarts
493 (*saliote*), bicycles, and buses. Of a sample of 140 house-
492 holds, only 9 percent owned a motor vehicle whereas 26
percent owned bicycles; 28 percent owned horsecarts (*saliote*)
494 and 48 percent owned horses. The percentage of households
369 owning bicycles and motor vehicles and those riding buses
to their bush allotments was higher for Nuku'alofa than the
rural areas, whereas understandably the reverse was true of
241 those owning horses and horsecarts. Farmers desiring to
494 transport considerable volumes of crops, firewood, or other
427 material often rent trucks or horsecarts. In maintaining
241 the fertility of the soil, Tongan farmers have considerable
242 empirical knowledge and understand the necessity of crop
rotation and a sufficient fallow period. They realize that
stands of large trees or certain shrubs and herbs, such as
Lantana camara, *Leucaena leucocephala*, *Paspalum conjugatum*,
and *Phaseolus semierectus*, indicate better soil than species
like *Panicum maximum*, *Cyperus rotundus*, or *Sida rhombifolia*.
They also realize that the length of the fallow period has
been declining and that the soils are presently more
impoverished than in the past. The primary means that most
Tongans use to improve soil fertility are fallowing and
[654] burning dead plant material. The government encourages the
use of commercial fertilizers, and out of 137 sample house-

241 242 654 holds, 41 percent have used commercial fertilizers at one time or another on their bush or town allotments. In almost all cases, however, it was used for commercial purposes and not on traditional vegetable or tree crops. Of those 56 households using fertilizer, 43 percent received it from the Agricultural Department; 39 percent from the Tonga Produce Board; 16 percent from the Coconut Replanting Scheme; and only 2 percent from other sources. 241 242 There are also very few instances of Tongans mulching their crops or planting green manure crops. Only the hyacinth bean (Dolichos lablab) is purposefully planted for green manure, and this practice is infrequent.

Similarly, the use of insecticides and fungicides is generally limited to commercial crops. Of the 133 households interviewed, only 23 percent used insecticides, and of these 31 households, 48 percent used them primarily for bananas; 48 percent for watermelons; and 3 percent for garden vegetables. The same pattern exists for the use of fungicides, with only 26 percent of the 133 sample households using fungicides. Very few if any people use herbicides to eliminate noxious weeds.

241 Irrigation is another technological problem hindering diversification of Tongan agriculture. Whereas subsistence crops, such as yams, taro, giant taro, bananas, and manioc, depend largely on available rainfall, commercial crops such as watermelons and garden vegetables need periodic watering.

241 Because there are no surface streams on Tongatapu, the
312 required water must come from either wells or storage tanks.
Of 134 sample households, only 33 percent water for cropping on their bush allotments. Of the 134 households, 13 percent had wells; 1 percent had cement catchment system; and 20 percent transported water from their town allotment or from other bush allotments. There are motorized pump irrigation systems on large plantations, lands of the missionary societies, and on a few bush allotments that were not included in the sample survey.

On town allotments irrigation is more prevalent. Out of 150 sample households, there was a greater percentage of households with dependable water sources: 29 percent with wells, 15 percent with cement tanks, 9 percent with corrugated iron tanks, 9 percent with private piped-in water, and
[365] 70 percent with access to a public water system. In the
area of Nuku'alofa where there is a public water system,
there is a corresponding increase in the intensity and
241 diversity of cropping and planting or ornamentals. This
231 however, is due partially to a law prohibiting unpenned or
656 untethered pigs and other animals in town.

242 The Department of Agriculture's Experimental Farm at
654 Vaini and a number of missionary societies have experimented
241 with a wide variety of new crops in an attempt to improve
subsistence and commercial agricultural production. These
241 experimental crops, as well as many past introductions such
242

241 242 as sorghum, rice, soybeans, and macadamia nuts, are very rarely found on bush or town allotments. With the exception of seeds for watermelons and garden vegetables, which are generally purchased at the large trading stores in Nuku'alofa, most planting material for crops grown on the allotments is obtained by Tongans either from their own stock or from friends.

231 654 [241] The Department of Agriculture has, since 1968, begun Pig, Poultry and Cattle Subsidy Schemes designed to upgrade Tongan livestock production. The Pig Subsidy Scheme, which was initiated in 1969, provided three weaner pigs, bred from New Zealand stock, to Tongan farmers who were willing to construct suitable pig sties with cement floors and a water supply, and to plant approved food crops--such as manioc, corn, and sweet potatoes. The Department also supplied the farmer with sufficient protein supplement until pigs reached slaughtering weight. The pigs were then to be marketed, after which the farmer would be credited with money to buy his own breeding stock and protein supplement to start his own pig farm (Government of Tonga, 1969a:15).

235 654 [439] The Poultry Subsidy Scheme, initiated in 1971, provides one-half of the initial poultry stock to those farmers who construct poultry houses according to Agriculture Department specifications. The poultry distributed to farmers is reared from New Zealand stock imported since 1970. Additional aims of the Poultry Subsidy Scheme include a

231 232 mares to upgrade the standard of work horses in the Kingdom.

654 Owing to the rapid elimination of native forest species
on Tongatapu, as a result of the need for firewood and
654 timber for banana shooks and other purposes, the Agriculture
245 Department has a limited reforestation program, which
318 includes nurseries at Sopu on Tongatapu and on 'Eua and the
[313] issuance of seedlings to interested allotment holders. The
major species which have been planted by individual allotment
holders have been *Casuarina equisitefolia*, *Eucalyptus
spp*., and *Grevillea robusta*, all natives of Australia, and
the tropical American *Cedrela odorata*. The only major
reforestation project in the Kingdom has been conducted on
'Eua, where 200 acres of *Pinus caribaea* have been successfully
established (Government of Tonga, 1971c:26). On
Tongatapu, there are only limited cases where farmers have
planted introduced forest species on their allotments.

241 In conclusion, the overall effect of the recent
231 introductions of new techniques and plant and animal
179 material on the Tongan agricultural system seems to have
241 been minimal. This is in spite of considerable subsidies
231 offered by government agencies and a recently expanded
654 agricultural extension program, yearly agriculture shows,
207 a system of "Rural Broadcasting" designed to improve agricultural
179 education over the radio, the establishment of a
Government Agricultural Training Center at the Experimental
Farm in Vaini, and a continued overall effort by the Agri-

241 culture Department to introduce improved plant and animal
231 varieties as well as improved husbandry practices. Out of
654 149 sample households only one belonged to the Pig Subsidy
179 Scheme and none to the Poultry or Cattle Subsidy Schemes.
[207] Where farmers have received help from these or the Banana
Subsidy or Coconut Replanting Schemes, few have adhered to
the specifications after receiving the benefits (Knowles,
1971, personal communication; Nusbaum, 1972, personal
communications; and Liyanage, 1971 personal communication).
241 The main effects of these attempts to bring about change
231 seem to be an increased planting of commercial crops such
179 as bananas, watermelons, and European vegetables and limited
expansion of livestock production. Other effects include
increased production of crops suitable for livestock feed,
such as manioc, sweet potato, and corn, isolated instances of
introduced pasture grasses, improved or new crop varieties,
and introduced forest species. There is also some evidence
of limited changes in general maintenance and husbandry
practices on both bush and town allotments.

CHAPTER IV

PLANT ASSOCIATIONS AND AGRICULTURAL PRACTICES ON BUSH ALLOTMENTS

128 The purpose of this chapter is to look at the cumulative effect of the three input variables: the physical environment, the cultural setting and economy, and the pool of available plant species. The survey of 101 bush allotments provided the data on which most of the description and analysis is based.

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311
137 The characteristic vegetation pattern of the bush allotment can be described most simply as a dynamic mosaic of plots containing a great variety of subsistence and cash crops within a matrix of secondary vegetation in various stages of regrowth. Throughout this mosaic of cultivated plants and secondary vegetation are scattered a variety of useful tree species which are cultivated or protected by Tongan farmers. The diversity of plant associations found on Tongatapu is well illustrated by a transect of a 2.04 mile (3.29 kilometers) portion of Tongatapu in the area of Veitongo. The transect extends from the coastal littoral forest of the upraised southern coast to the mangrove swamps of the low-lying northern coast (Figures 12 and 13). There are many crops, crop combinations, stages of secondary regrowth and scattered tree species found on this portion of the island. In

[TEXT CONTINUED ON PAGE 198]

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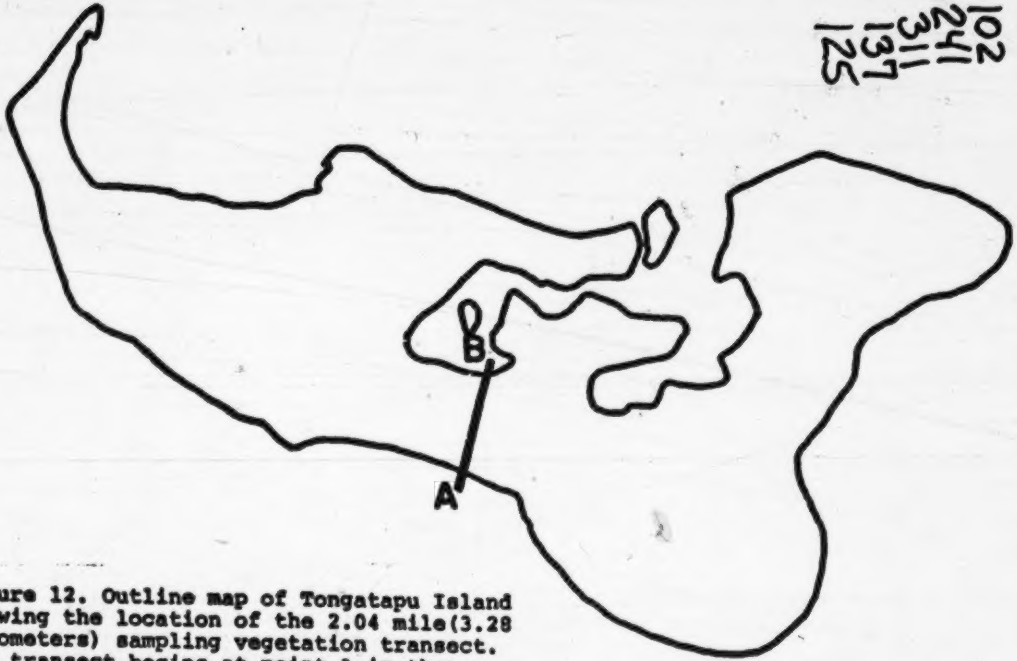

Figure 12. Outline map of Tongatapu Island showing the location of the 2.04 mile(3.28 kilometers) sampling vegetation transect. The transect begins at point A in the coastal littoral forests of the upraised south coast and ends at point B in the mangrove forests along the low-lying north coast.

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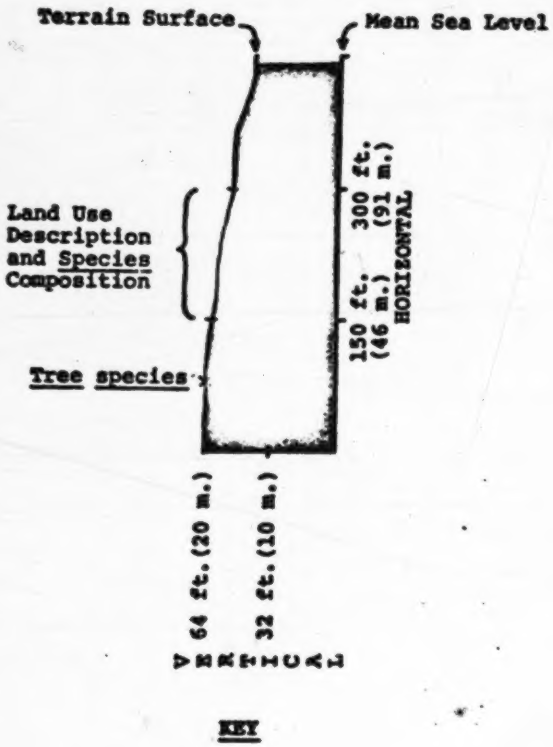
Terrain Surface
Mean Sea Level
Land Use Description and Species Composition
Tree species
150 ft. (46 m.)
300 ft. (91 m.)
HORIZONTAL
64 ft. (20 m.)
32 ft. (10 m.)
VERTICAL
KEY

Figure. 13. Tongatapu land use and vegetation transect and key.

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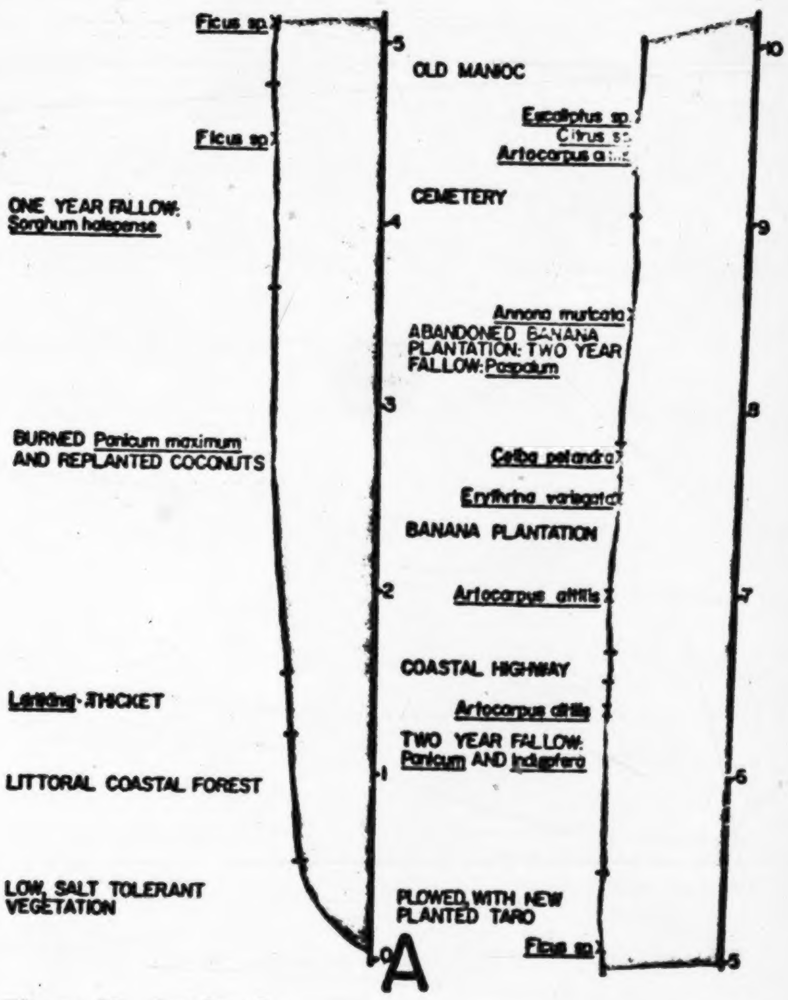
Ficus sp.
0
1
2
3
4
5
OLD MANIOC
Ficus sp.
ONE YEAR FALLOW: Sorghum halepense
CEMETERY
Escaliptus sp.
Citrus sp.
Artocarpus a
10
9
8
7
6
5
Annona muricata
ABANDONED BANANA PLANTATION: TWO YEAR FALLOW: Paspalum
BURNED Panicum maximum AND REPLANTED COCONUTS
Ceiba petandra
Erythrina variegata
BANANA PLANTATION
Artocarpus altilis
COASTAL HIGHWAY
Lantana THICKET
Artocarpus altilis
TWO YEAR FALLOW: Panicum AND Indigofera
LITTORAL COASTAL FOREST
LOW, SALT TOLERANT VEGETATION
PLOWED, WITH NEW PLANTED TARO
Ficus sp.
A

Figure 13. Continued .

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● 241
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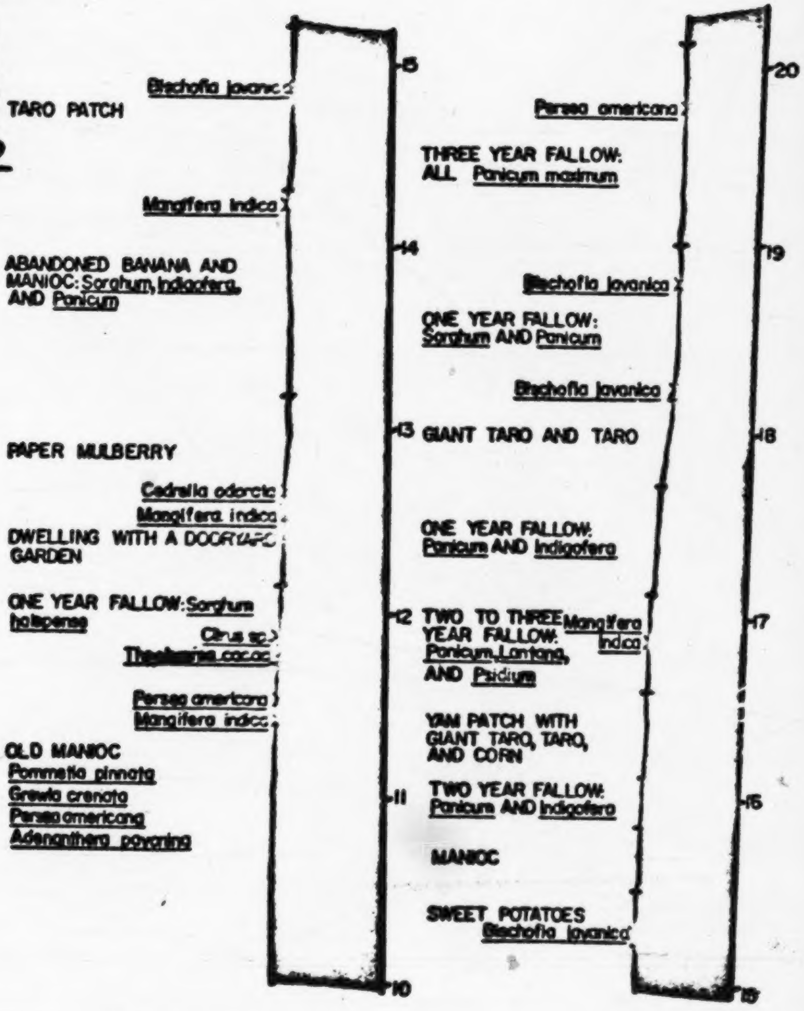
TARO PATCH
Bischofia javanica
15
Mangifera indica
14
ABANDONED BANANA AND MANIOC: Sorghum, Indigofera, AND Panicum
13
PAPER MULBERRY
Cedrella odorata
Mangifera indica
DWELLING WITH A DOORYARD GARDEN
ONE YEAR FALLOW: Sorghum halepense
12
Citrus sp.
Theobroma cacao
Persea americana
Mangifera indica
OLD MANIOC
Pommetia pinnata
Grewia crenata
Persea americana
Adenanthera pavonina
11
10
20
Persea americana
THREE YEAR FALLOW: ALL Panicum maximum
19
Bischofia javanica
ONE YEAR FALLOW: Sorghum AND Panicum
Bischofia javanica
18
GIANT TARO AND TARO
ONE YEAR FALLOW: Panicum AND Indigofera
17
TWO TO THREE YEAR FALLOW: Panicum, Lantana, AND Psidium
Mangifera indica
YAM PATCH WITH GIANT TARO, TARO, AND CORN
16
TWO YEAR FALLOW: Panicum AND Indigofera
MANIOC
SWEET POTATOES
Bischofia javanica
15

Figure 13. Continued.

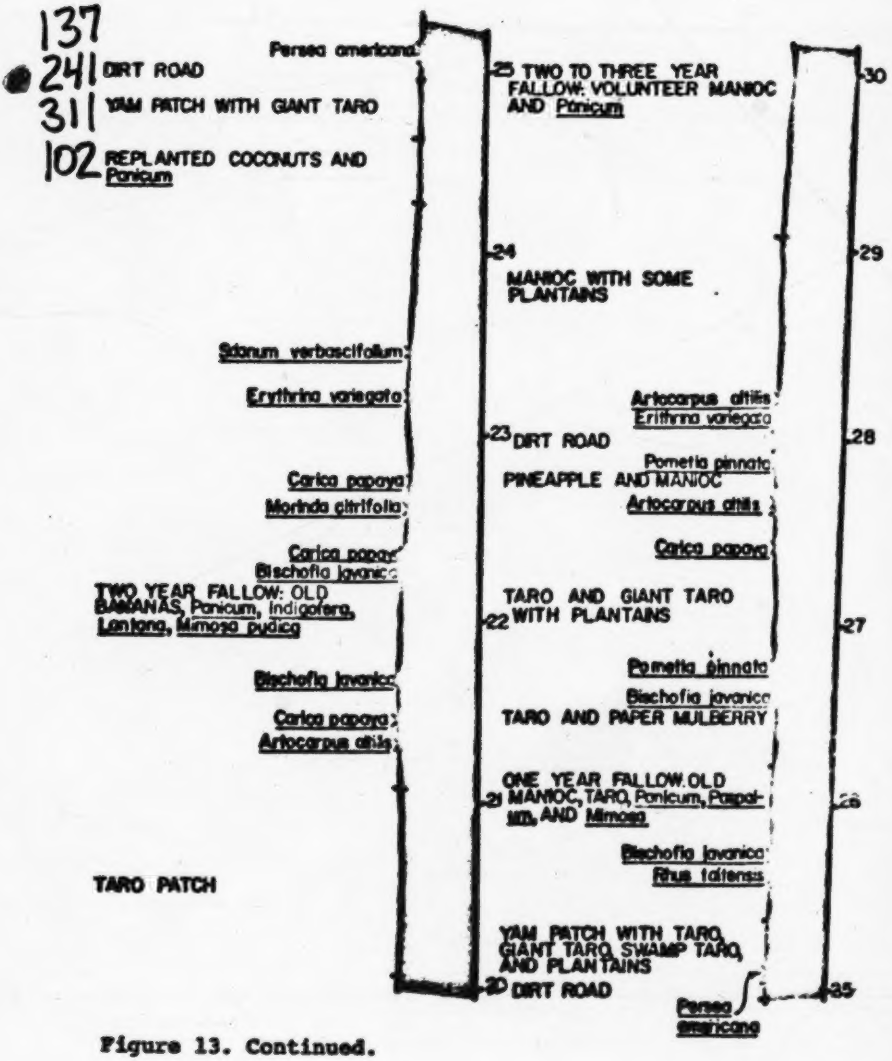
137
241 DIRT ROAD
311 YAM PATCH WITH GIANT TARO
102 REPLANTED COCONUTS AND Panicum
Persea americana
25 TWO TO THREE YEAR FALLOW: VOLUNTEER MANIOC AND Panicum
30
24
29
MANIOC WITH SOME PLANTAINS
Solanum verbascifolium
Erythrina variegata
Artocarpus altilis
Erithrina variegata
23 DIRT ROAD
28
Pometia pinnata
Carica papaya
PINEAPPLE AND MANIOC
Morinda citrifolia
Artocarpus altilis
Carica papaya
Carica papaya
Bischofia javanica
TWO YEAR FALLOW: OLD BANANAS, Panicum, Indigofera, Lantana, Mimosa pudica
TARO AND GIANT TARO WITH PLANTAINS
22
27
Pometia pinnata
Bischofia javanica
Bischofia javanica
Carica papaya
TARO AND PAPER MULBERRY
Artocarpus altilis
ONE YEAR FALLOW: OLD MANIOC, TARO, Panicum, Paspalum, AND Mimosa
21
26
Bischofia javanica
Rhus taitensis
TARO PATCH
YAM PATCH WITH TARO, GIANT TARO, SWAMP TARO, AND PLANTAINS
20 DIRT ROAD
25
Persea americana

Figure 13. Continued.

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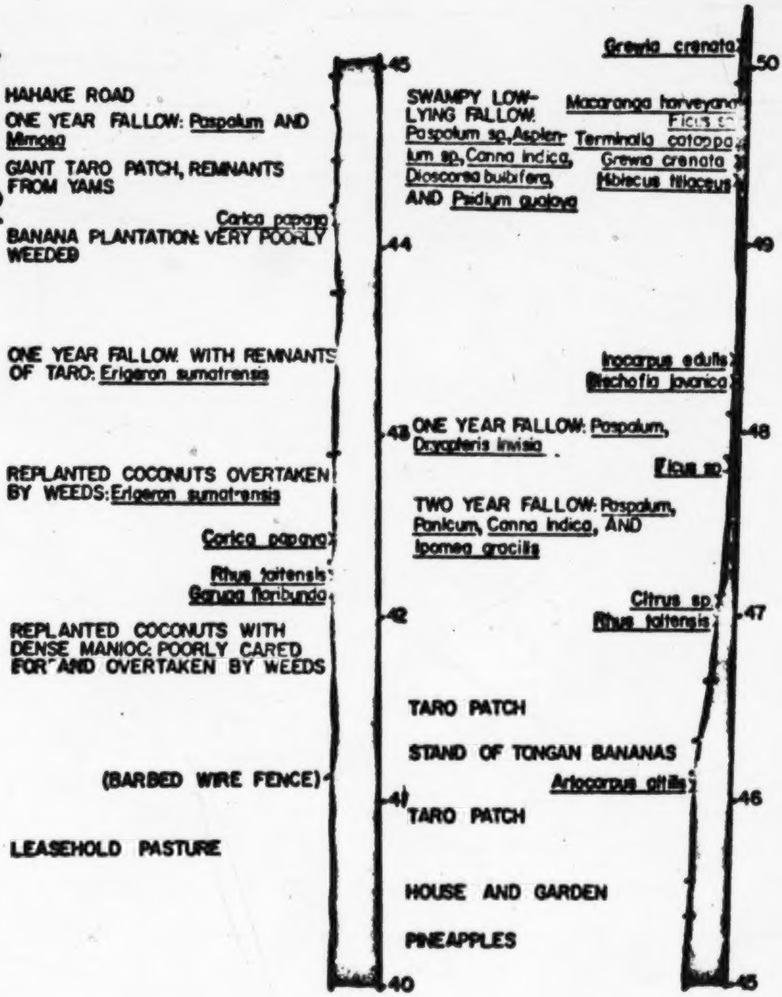
HAHAKE ROAD
ONE YEAR FALLOW: Paspalum AND Mimosa
GIANT TARO PATCH, REMNANTS FROM YAMS
Carica papaya
BANANA PLANTATION: VERY POORLY WEEDED
ONE YEAR FALLOW WITH REMNANTS OF TARO: Erigeron sumatrensis
REPLANTED COCONUTS OVERTAKEN BY WEEDS: Erigeron sumatrensis
Carica papaya
Rhus taitensis
Garuga floribunda
REPLANTED COCONUTS WITH DENSE MANIOC: POORLY CARED FOR AND OVERTAKEN BY WEEDS
(BARBED WIRE FENCE)
LEASEHOLD PASTURE
45
44
43
42
41
40
SWAMPY LOW-LYING FALLOW: Paspalum sp., Asplenium sp., Canna indica, Dioscorea bulbifera, AND Psidium guajava
ONE YEAR FALLOW: Paspalum, Dryopteris invisia
TWO YEAR FALLOW: Paspalum, Panicum, Canna indica, AND Ipomea gracilis
TARO PATCH
STAND OF TONGAN BANANAS
TARO PATCH
HOUSE AND GARDEN
PINEAPPLES
Grewia crenata
Macaranga harveyana
Ficus sp.
Terminalia catappa
Grewia crenata
Hibiscus tiliaceus
Inocarpus edulis
Bischofia javanica
Ficus sp.
Citrus sp.
Rhus taitensis
Artocarpus altilis
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Figure 13. Continued.

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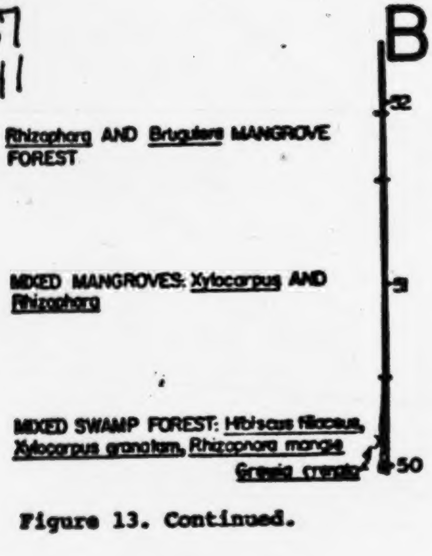

B
32
Rhizophora AND Bruguiera MANGROVE FOREST
31
MIXED MANGROVES: Xylocarpus AND Rhizophora
MIXED SWAMP FOREST: Hibiscus tiliaceus, Xylocarpus granatum, Rhizophora mangle
Grewia crenata
50

Figure 13. Continued.

241 comparison with other portions of Tongatapu, however, this
311 area has a relatively uniform secondary regrowth dominated
137 by Panicum maximum (saafa) and other grasses and relatively
125 few important tree species. For Tongatapu as a whole,
128 because of the diversity of plant species and associations,
241 as well as their rapidly changing nature, it was decided to
311 conduct an exhaustive random sampling survey of the bush
137 allotments as described in Chapter I and Appendix A.[A]
Consequently, the quantitative data presented are based on
the survey of 101 or 1.8 percent of the approximately
5,652 bush allotments on Tongatapu. The sampled allotments
had a combined area of 806 acres (326 hectares), 1.8 percent of the 45,214 acres (18,298 hectares) of bush allot-
128 ments on Tongatapu. From the total of 101 sample bush
241 allotments, 29 allotments were mapped to give the reader a
311 feeling for the diversity of agricultural landscapes
137 (Table 28 and Figures 14-42). In an effort to subjectively
[126] evaluate distributional patterns of vegetation types or
128 other related agricultural phenomena, the presence or
absence of each item in the survey was plotted on maps of
Tongatapu. An example of these maps is shown in Figure 43.

Extent of Cultivation

311 In the sample of 101 bush allotments, approximately
241 275 acres (111 hectares) or 34 percent of the total area
was cultivated. This amounted to an average cultivated area
of 2.7 acres (1.1 hectares) per allotment. However, of the

[A] [See Category 125, pp. 10-15, 350-358--Analyst.]

[TEXT CONTINUED ON PAGE 239]

102
241
311
137
245

Table 28. Key to important tree species for maps of sample bush allotments (Figures 14-42). Allotment numbers refer to sample numbers used during the survey.

Symbol	Scientific Name	English Name	Tongan Name
Aa	Artocarpus altilis	breadfruit	mei
Am	Aleurites moluccana	candlenut	tuitui
Amu	Annona muricata	soursop	'apele 'Initia
Ap	Adenanthera pavonina	bead tree	lopa
Az	Alphitonia zizyphoides		toi
Ba	Barringtonia asiatica	poison fish tree	futu
Bc	Bruguiera conjugata	mangrove	tongo
Bj	Bischofia javanica		koka
Br	Burkella richii		kau
C	Citrus medica	citron	kola
Ci	Calophyllum inophyllum		feta'u
Cl	Citrus limon	lemon	lemani
Cm	Citrus maxima	pomelo	moli Tonga
Cma	Cerbera manghas		toto
Co	Cananga odorata	perfume tree	mohokoi
Cod	Cedrela odorata	silky oak	sita Palangi
Cp	Ceiba pentandra	kapok	vavae
Cr	Citrus reticulata	mandarin	molipeli
Cs	Citrus sinensis	orange	moli kai
Df	Diospyros ferrea		kanume
Dfo	Dysoxylon forsteri		mo'ota

Table 28. Continued.

102
241
311
137
245

Symbol	Scientific Name	English Name	Tongan Name
Dl	*Diospyros laterifolia*		*mapa*
Ea	*Excoecaria agallocha*		*feta'anu*
Ef	*Ellatostachys falcata*		*ngatata*
Eo	*Ervatamia orientalis*		*te'ete'emanu*
Et	*Elaeocarpus tonganus*		*ma'ama'alava*
Ev	*Erythrina variegata*	coral tree	*ngatae*
Fb	*Fagraea berteriana*		*pua Tonga*
Fo	*Ficus obliqua*		*'ovava*
Fs	*Ficus scabra*		*masi'ata*
Ga	*Gyrocarpus americanus*		*puko*
Gc	*Grewia crenata*		*fo'ui*
Gf	*Garunga floribunda*		*manaui*
Gr	*Glochidion ramiflorum*		*malolo, masikoka*
Gro	*Grevillea robusta*	silky oak	*'oke*
Gs	*Garcinia sessilis*		*heilala*
Hl	*Heritiera littoralis*		*ifi tahi*
Hn	*Homolanthus nutans*		*malamala'afonua*
Ho	*Hernandia ovigera*		*fotulona*
Ht	*Hibiscus tiliaceus*	hibiscus	*kaute*
Ie	*Inocarpus edulis*	Tahitian chestnut	*ifi*
Jc	*Jatropha curcas*	physic nut	*fiki*
Ll	*Lumnitzera littorea*		*hangale*

Table 28. Continued

102
● 241
311
137
245

Symbol	Scientific Name	English Name	Tongan Name
Ma	*Melia azedarach*		*sita*
Mc	*Morinda citrifolia*		*nonu*
Mh	*Macaranga harveyana*		*loupata*
Mhy	*Myristica hypargyraea*	nutmeg	*kotone*
Mi	*Mangifera indica*	mango	*mango*
Mm	*Mertya macrophylla*		*kulukulu*
Oo	*Ochrosia oppositifolia*		*fao*
Pa	*Persea americana*	avocado	'*avoka*
Pac	*Plumeria acuminata*	frangipani	*kalosipani*
Par	*Pittosporum arborescens*		*masi'aukava*
Pg	*Psidium guajava*	guava	*kuava*
Pgl	*Parinarium glaberrimum*		*pipi, pipi failolo*
Pp	*Pometia pinnata*		*tava*
Ppe	*Prunus persica*	peach	*piisi*
Pt	*Pandanus tectorius*	screw pine	*fa*
Rm	*Rhizophora mangle* or *R. mucronata*	mangrove	*tongo*, *tongolei*
Rt	*Rhus taitensis*		*tavahi*
Scl	*Syzygium clusiaefolium*		*fekika vao*
Sc	*Syzygium corynocarpium*		*hehea*

Table 28. Continued

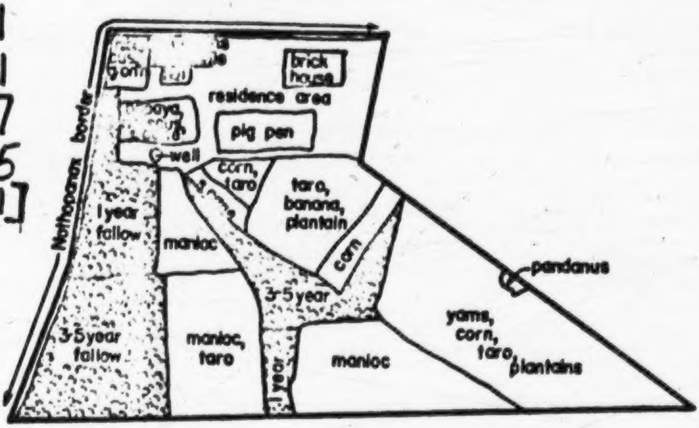
102
241
311
137
245

Symbol	Scientific Name	English Name	Tongan Name
Sd	*Spondias dulcis*		*vi*
Sj	*Syzygium jambos*	rose apple	*fekika Palangi*
Sm	*Syzygium malaccense*	malay apple	*fekika kai*
Sy	*Santalum yasi*	sandlewood	*ahi*
Ta	*Tournefortia argentea*	beach heliotrope	*touhuni*
Tc	*Terminalia catappa*	Indian almond	*telie*
Ts	*Tarenna sumbucina*		*manonu*
Va	*Vavaea amicorum*		*ahi vao*
Xg	*Xylocarpus granatum*	cannonball tree	*lekileki*

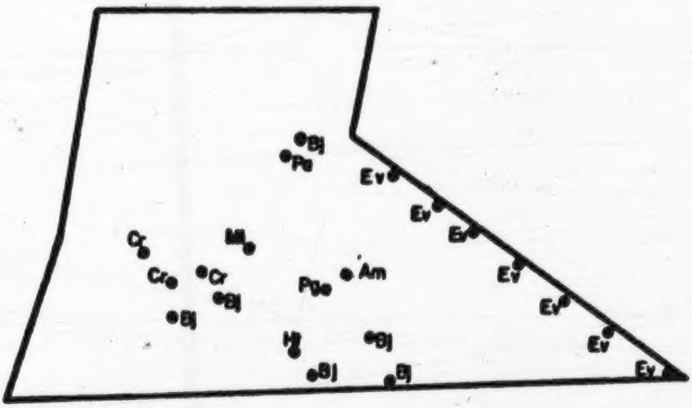
102
● 241
311
137
245
[351]

Figure 14. SAMPLE BUSH ALLOTMENT NO. 2

Location: Hofoa Area: 8.25 Acres


brick house
residence area
pig pen
well
corn, taro
taro, banana, plantain
Nathoooan border
1 year fallow
manioc
corn
pandanus
3-5 year
yams, corn, taro, plantains
3-5 year fallow
manioc, taro
1 year
manioc

Distribution of Major Crops


Bj
Pa
Ev
Ev
Ev
Cr
Ml
Cr
Cr
Pg
Am
Ev
Bj
Ev
Bj
Hi
Bj
Ev
Bj
Bj
Ev

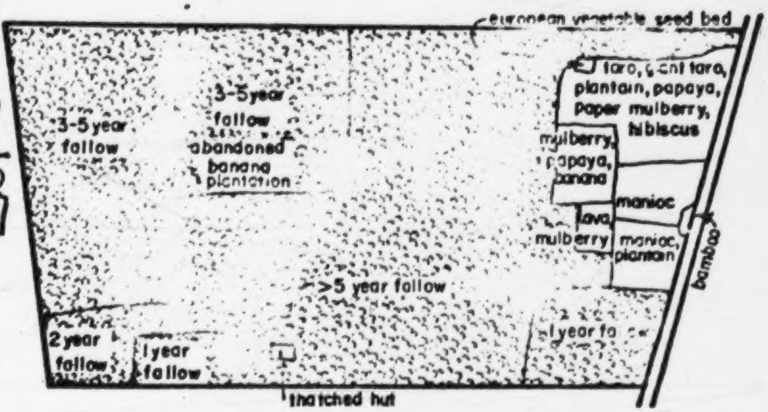
Distribution of Important Tree Species

(Coconut Coverage: 75% Mature Palms; No Replanted Palms.)

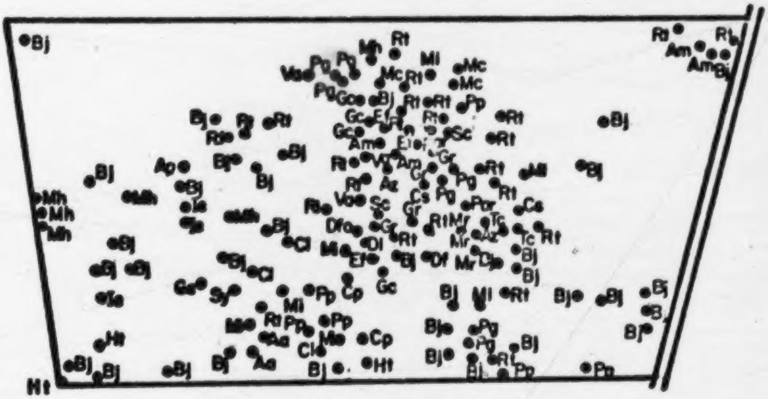
Figure 15. SAMPLE BUSH ALLOTMENT NO. 3

Location: Hofoa Area: 8.26 Acres

102
241
311
137
245
[351]


european vegetable seed bed
taro, giant taro, plantain, papaya, paper mulberry, hibiscus
3-5 year fallow
3-5 year fallow abandoned banana plantation
mulberry, papaya, banana
manioc
kava
mulberry
manioc, plantain
bamboo
>5 year fallow
2 year fallow
1 year fallow
1 year fallow
thatched hut

Distribution of Major Crops


Bj
Mh
Rt
Mi
Mc
Mc
Rt
Pp
Pg
Vae
Gc
Bj
Rt
Rt
Sc
Rt
Am
Ef
Vg
Az
Cs
Pg
Gr
Cs
Dfa
Ci
Mi
Ef
Df
Mr
Ge
Sy
Pp
Cp
Gc
Ht
Aa
Cl
Ap
Bj
Ht

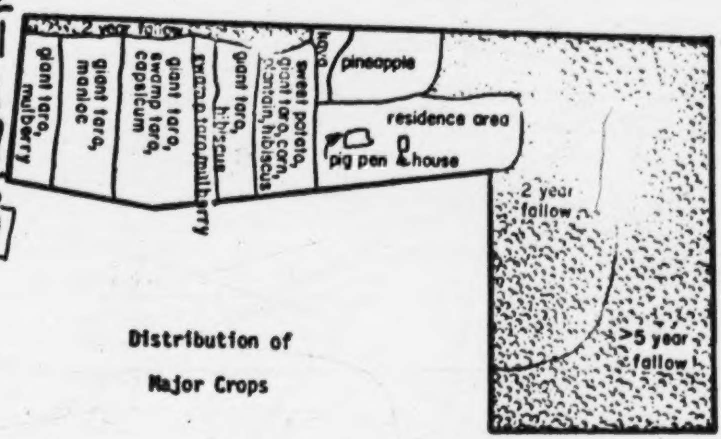
Distribution of Important Tree Species

(Coconut Coverage: 75% Mature Palms; No Replanted Palms.)

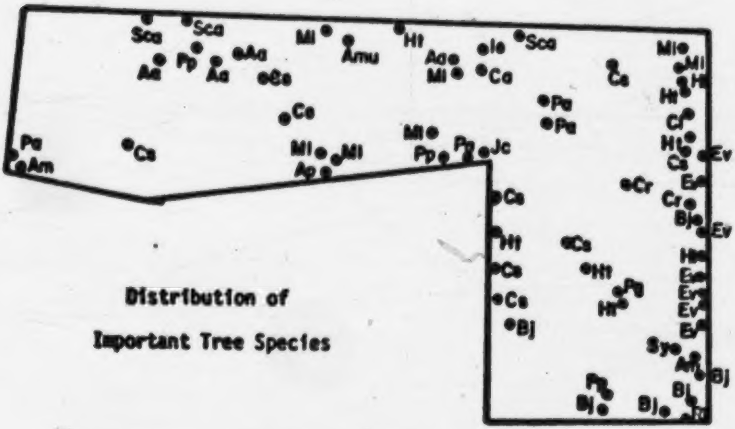
Figure 16. SAMPLE BUSH ALLOTMENT NO. 6

Location: Haveluloto Area: 6.41 Acres

102
●241
311
137
245
[351]


2 year fallow
giant taro, mulberry
giant taro, manioc
giant taro, swamp taro, capsicum
giant taro, swamp taro, mulberry
giant taro, hibiscus
sweet potato, giant taro, corn, plantain, hibiscus
kava
pineapple
residence area
pig pen
house
2 year fallow
>5 year fallow

Distribution of
Major Crops


Sca
Sca
Aa
Pp
Aa
Aa
Ca
Ml
Amu
Ht
Aae
Ml
le
Ca
Sca
Cs
Ml
Ml
Ht
Ht
Ce
Pa
Pa
Pa
Am
Cs
Ml
Ml
Ap
Ml
Pp
Pp
Jc
Cl
Ht
Cs
Ev
E
Cr
Cr
Bj
Ev
Ca
Ht
Ca
Cs
Ht
Cs
Pa
Ht
Bj
Ht
E
Ev
Ev
E
Syo
Am
Bj
Bl
Pa
Bj
Bj

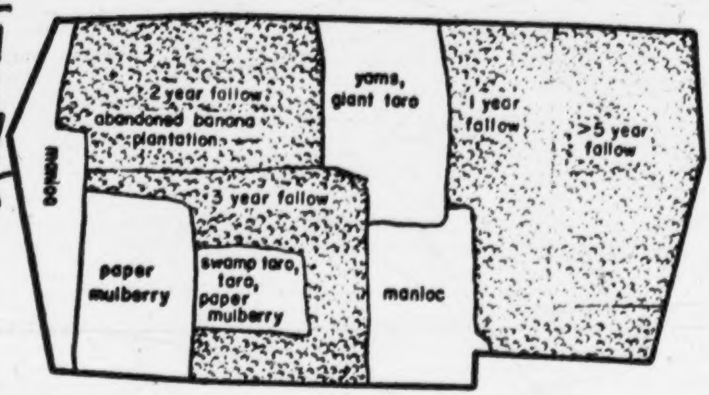
Distribution of
Important Tree Species

(Coconut Coverage: 50% Mature Palms; No Replanted Palms.)

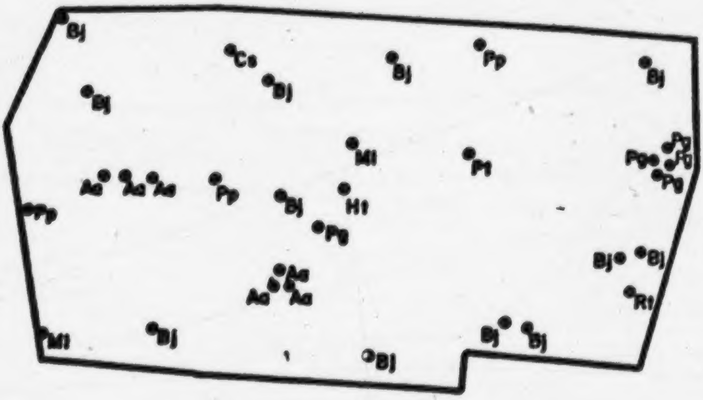
Figure 17. SAMPLE BUSH ALLOTMENT NO. 10

Location: Ma'ufanga **Area:** 8.36 Acres

102
241
311
137
245


2 year fallow
abandoned banana plantation
yams, giant taro
1 year fallow
>5 year fallow
manioc
3 year fallow
paper mulberry
swamp taro, taro, paper mulberry
manioc

Distribution of Major Crops'


Bj
Cs
Bj
Bj
Pp
Bj
Bj
Ml
Pt
Pg
Pgo
Rt
Pg
Aa
Aa
Aa
Pp
Bj
Ht
Pp
Pg
Aa
Aa
Aa
Bj
Bj
Rt
Ml
Bj
Bj
Bj
Bj

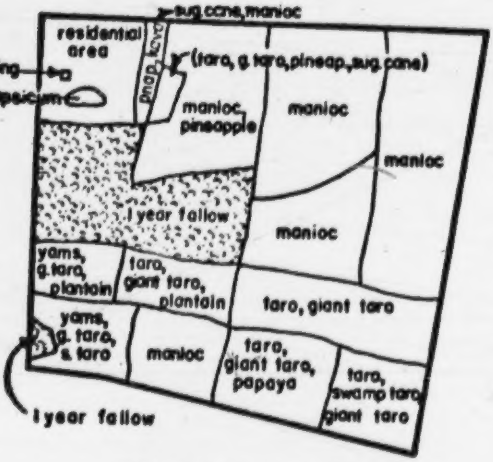
Distribution of Important Tree Species

(Coconut Coverage: 50% Mature Palms; No Replanted Palms.)

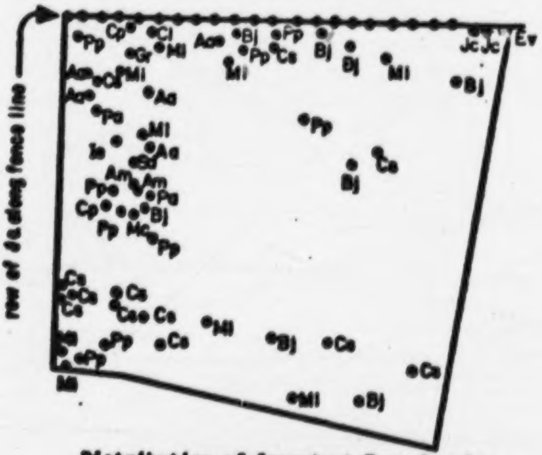
Figure 18. SAMPLE BUSH ALLOTMENT NO. 12

Location: Hofoa Area: 4.76 Acres

102
● 241
311
137
245
[351]


sug.cane, manioc
residential area
dwelling
capsicum
pinap, kava
(taro, g.taro, pineap, sug.cane)
manioc, pineapple
manioc
manioc
1 year fallow
manioc
yams, g.taro, plantain
taro, giant taro, plantain
taro, giant taro
yams, g. taro, s. taro
manioc
taro, giant taro, papaya
taro, swamp taro, giant taro
1 year fallow

Distribution of Major Crops

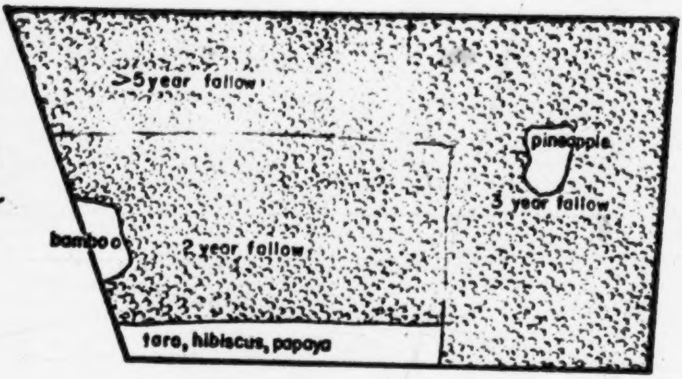

fence line
Pp
Cp
Cl
Gr
Ml
Ac
Bj
Pp
Pp
Cs
Ml
Bj
Bj
Ml
Bj
Jc
Jc
Ev
Am
Cs
Ml
Ac
Aa
Pa
Ml
Ie
Aa
Sd
Am
Am
Pp
Pa
Cp
Bj
Pp
Mc
Pp
Pp
Bj
Cs
Cs
Cs
Cs
Cs
Cs
Cs
Ml
Pp
Cs
Ml
Bj
Cs
Pp
Cs
Ml
Ml
Bj

Distribution of Important Tree Species
(Coconut Coverage: 75% Mature Palms; 10% Replanted Palms.)

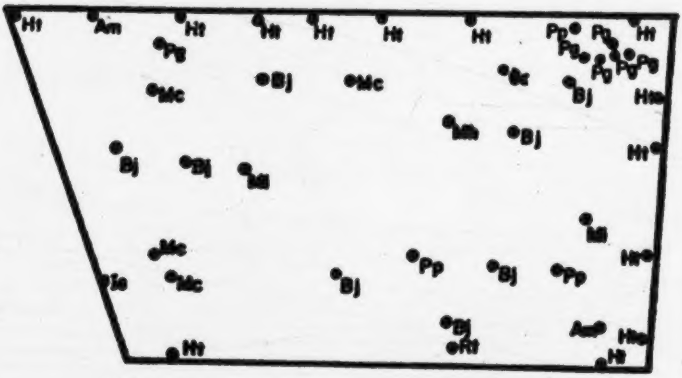
Figure 19. SAMPLE BUSH ALLOTMENT NO. 15

Location: Liahona **Area:** 8.25 Acres

102
● 241
311
137
245


>5year fallow
pineapple
3 year fallow
bamboo
2 year fallow
taro, hibiscus, papaya

Distribution of Major Crops


Ht
Am
Ht
Ht
Ht
Ht
Ht
Pp
Pg
Ht
Pg
Pg
Pg
Pg
Mc
Bj
Mc
Bc
Bj
Ht
Mh
Bj
Ht
Bj
Bj
Mi
Mi
Mc
Ht
Pp
Bj
Pp
Mc
Bj
Bj
Rt
Am
Ht
Ht
Ht

Distribution of Important Tree Species

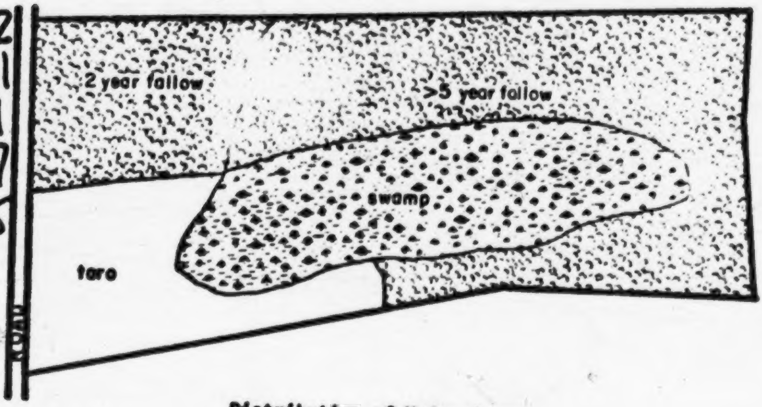
(Coconut Coverage: 50% Mature Palms; 5% Replanted Palms.)

88: Thaman K-5 (1967-1973) 1978 OU9 Tonga OU9
Tongatapu

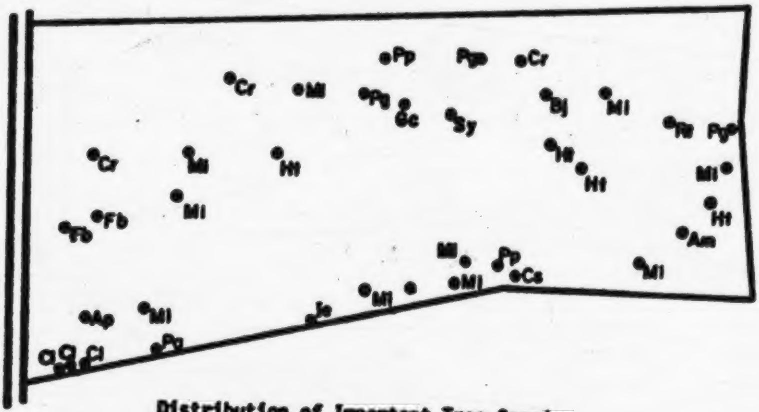
Figure 20. SAMPLE BUSH ALLOTMENT NO. 19

Location: Fatai Area: 8.27 Acres

102
241
311
137
245


2 year fallow
>5 year fallow
swamp
taro

Distribution of Major Crops


Pp
Pgm
Cr
Cr
Ml
Pg
Cc
Sy
Bj
Ml
Rr
Py
Cr
Ml
Ht
Ht
Ht
Ml
Ml
Ht
Fb
Fb
Am
Ml
Pp
Ml
Cs
Ml
Ml
Jc
Ap
Ml
Pg
Cl
Cl
Cl

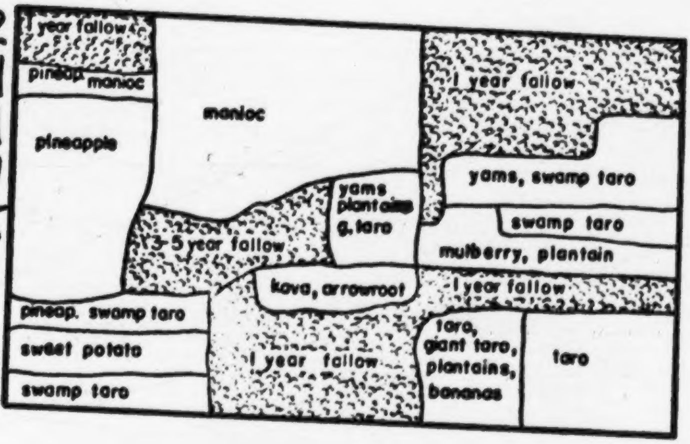
Distribution of Important Tree Species

(Coconut Coverage: No Coconuts.)

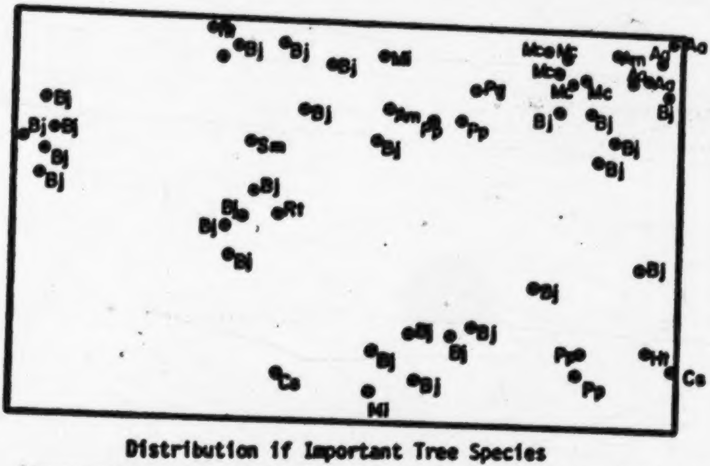
Figure 21. SAMPLE BUSH ALLOTMENT NO. 21

Location: Lakepa Area: 8.25 Acres

102
241
311
137
245


1 year fallow
pineap. manioc
pineapple
manioc
1 year fallow
yams, swamp taro
swamp taro
yams plantains g. taro
3-5 year fallow
mulberry, plantain
kava, arrowroot
1 year fallow
pineap. swamp taro
sweet potato
swamp taro
1 year fallow
taro, giant taro, plantains, bananas
taro

Distribution of Major Crops

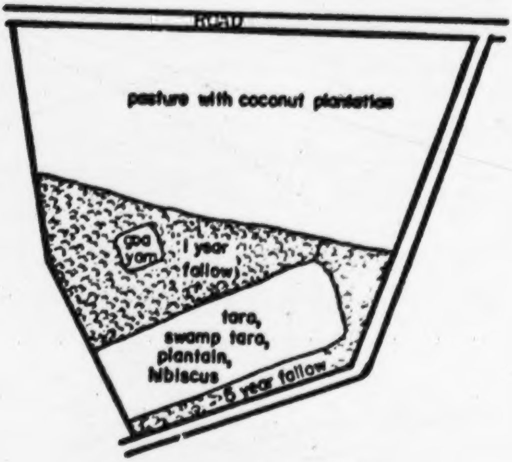

Bj
Bj
Bj
Mi
Mco Mc
Mco
Mc
Mc
Am
Ag
Ag
Bj
Pg
Am
Pp
Pp
Bj
Bj
Bj
Sm
Bj
Bj
Bj
Bj
Bj
Bj
Rt
Bj
Bj
Bj
Bj
Bj
Bj
Bj
Pp
Hi
Cs
Pp
Cs
Bj
Mi

Distribution if Important Tree Species
(Coconut Coverage: 25% Mature Palms; 75% Replanted Palms.)

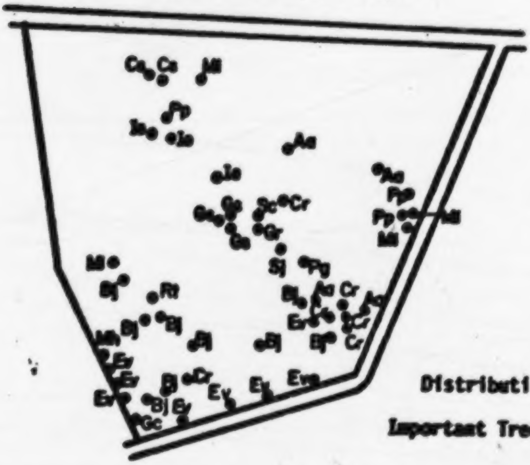
Figure 22. SAMPLE BUSH ALLOTMENT NO. 27

Location: Fe'ui Area: 5.01 Acres

102
241
311
137
245


ROAD
pasture with coconut plantation
gao yam
1 year fallow
taro, swamp taro, plantain, hibiscus
5-6 year fallow

Distribution of Major Crops


Cs
Cs
Mi
Pp
Ie
Ie
Aa
Ie
Aa
Pp
Gc
Gc
Sc
Cr
Pp
Mi
Gr
Gc
Mi
Mi
Sj
Pg
Bj
Rt
Bj
Aa
Cr
Aa
Bj
Bj
Er
Cr
Mh
Bj
Bj
Bj
Cr
Er
Er
Bj
Cr
Ev
Ev
Eva
Er
Bj
Ev
Gc

Distribution of

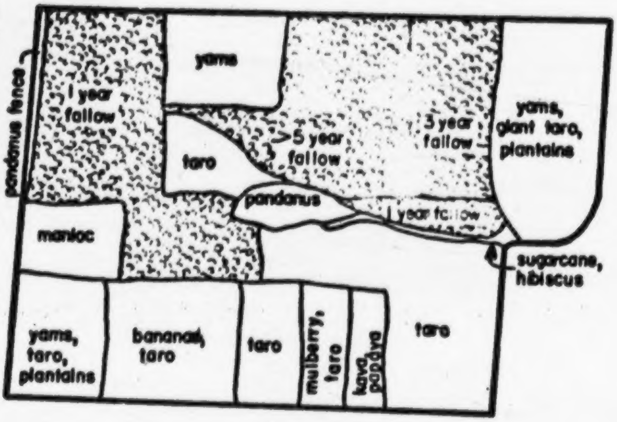
Important Tree Species

(Coconut Coverage: 100% Mature Palms; 10% Replanted Palms.)

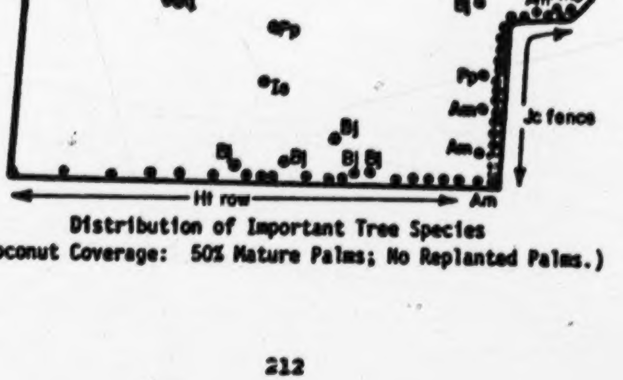
Figure 23. SAMPLE BUSH ALLOTMENT NO. 28

Location: Kolovai Area: 12.00 Acres

102
241
311
137
245


pandanus fence
1 year fallow
yams
taro
5 year fallow
3 year fallow
yams, giant taro, plantains
pandanus
1 year fallow
manioc
sugarcane, hibiscus
yams, taro, plantains
bananas, taro
taro
mulberry, taro
kava, papaya
taro

Distribution of Major Crops

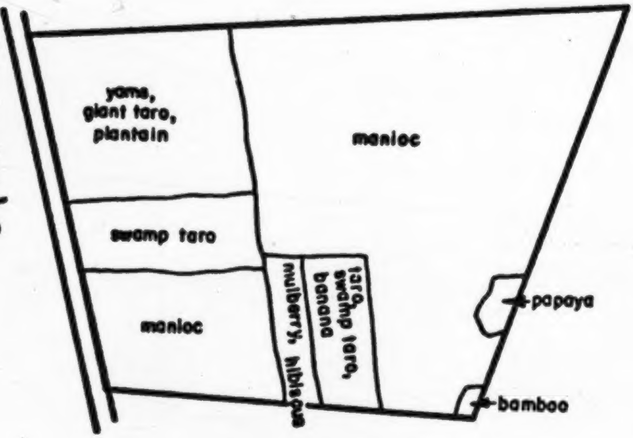

Pt
Aa
Dfo
Ml
Oo
Gc
Oo
Bj
Mh
Pg
Mc
Mc
Bj
Bj
Bj
Bj
Rt
Sm
Cs
Bj
Pp
Pp
Bj
Am
Am
Am
Is
Pp
Am
Jc fence
Am
Bj
Bj
Bj
Bj
Bj
Ht row
Am

Distribution of Important Tree Species
(Coconut Coverage: 50% Mature Palms; No Replanted Palms.)

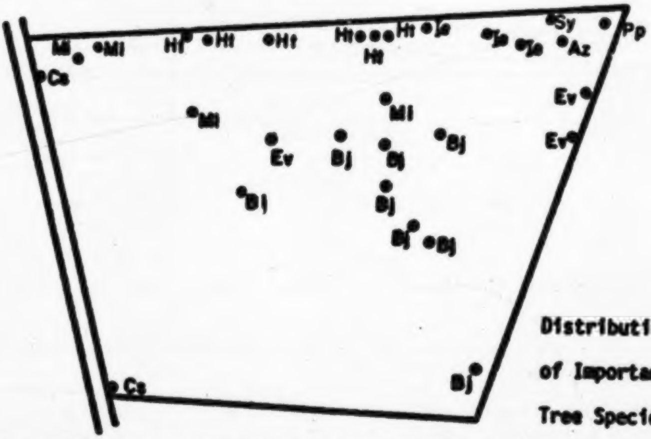
Figure 24. SAMPLE BUSH ALLOTMENT NO. 30

Location: 'Ahau Area: 3.05 Acres

102
241
311
137
245


yams,
giant taro,
plantain
manioc
swamp taro
manioc
mulberry, hibiscus
taro,
swamp taro,
banana
papaya
bamboo

Distribution of Major Crops


Ml
Ml
Cs
Ht
Ht
Ht
Ht
Ht
Ht
Ja
Ja
Ja
Sy
Pp
Az
Ev
Ev
Ml
Ml
Ev
Bj
Bj
Bj
Bj
Bj
Bj
Bj
Bj
Cs

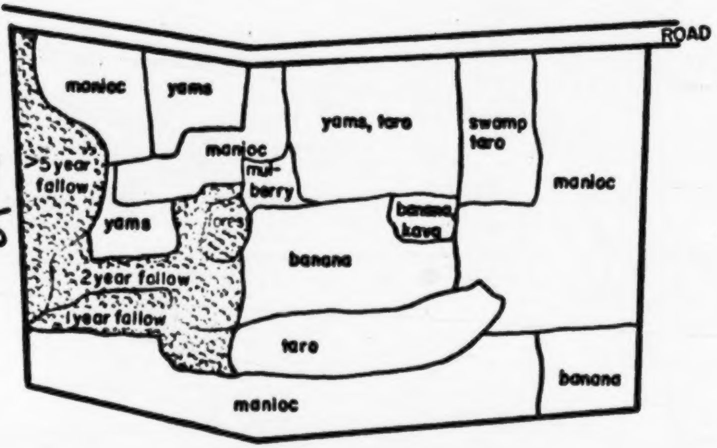
Distribution of Important Tree Species

(Coconut Coverage: 25% Mature Palms; 100% Replanted Palms.)

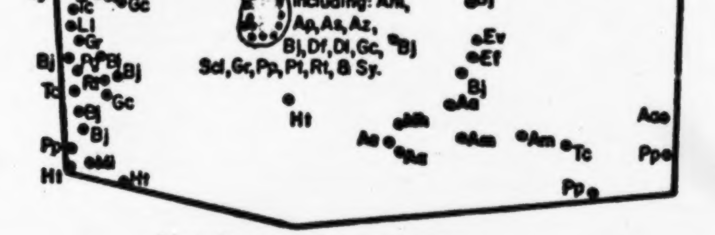
Figure 25. SAMPLE BUSH ALLOTMENT NO. 31

Location: Ha'akili Area: 8.30 Acres

102
241
311
137
245


ROAD
manioc
yams
manioc
mulberry
yams, taro
swamp taro
manioc
>5 year fallow
yams
forest
banana, kava
banana
2 year fallow
1 year fallow
taro
banana
manioc

Distribution of Major Crops

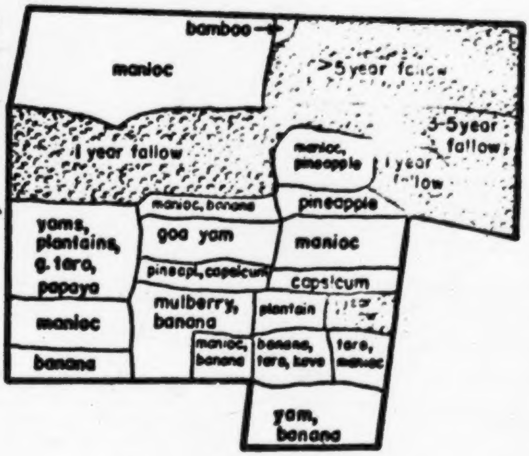

Sd
Bj
Aa
Bj
Pp
Ae
Bj
Bj
Sy
Cp
Cp
Cr
Rt
Sy
Cc
Gc
Tc
Li
Gr
Bj
Bj
Tc
Gc
Bj
Bj
Pp
Mi
Ht
Ht
Bj
Bj
Bj
Mi
Ht
Ev
Am
Mi
Mi
dense forest stand including: Am, Ap, As, Az, Bj, Df, Dl, Gc, Sd, Gr, Pp, Pt, Rt, & Sy.
Bj
Bj
Ev
Ef
Bj
Aa
Ht
Ae
Aa
Am
Am
Tc
Ace
Ppe
Pp

Distribution of Tree Species
(Coconut Coverage: 75% Mature Palms; 75% Replanted Palms.)

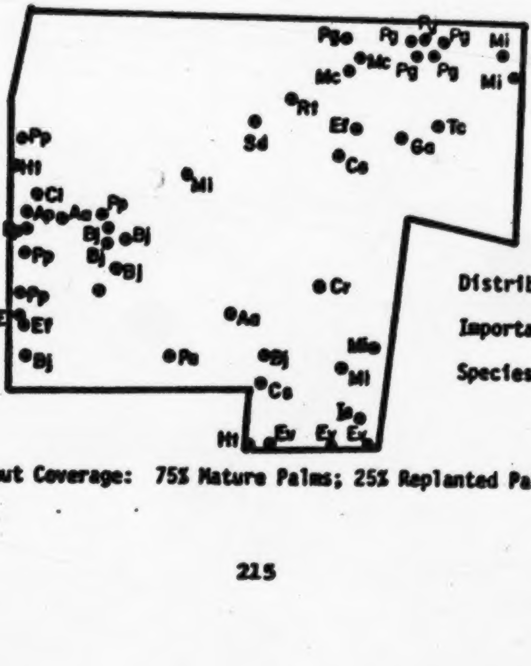
Figure 26. SAMPLE BUSH ALLOTMENT NO. 34

Location: Neiafu Area: 6.22 Acres

102
●241
311
137
245


bamboo
manioc
>5 year fallow
1 year fallow
3-5 year fallow
manioc, pineapple
1 year fallow
manioc, banana
pineapple
yams, plantains, g. taro, papaya
goa yam
manioc
pineapl, capsicum
capsicum
mulberry, banana
plantain
manioc
banana
manioc, banana
banana, taro, kava
taro, manioc
yam, banana

Distribution of Major Crops


Pg
Pg
Pg
Pg
Mi
Mc
Mc
Pg
Pg
Mi
Rt
Sd
Ef
Tc
Ga
Ce
Pp
Ht
Mi
Cl
Ap
Aa
Pp
Bj
Bj
Bj
Pp
Bj
Pp
Ef
Ef
Cr
Aa
Bj
Pu
Bj
Mfe
Mi
Cs
Ia
Ht
Ev
Ex
Ex

Distribution of Important Tree Species

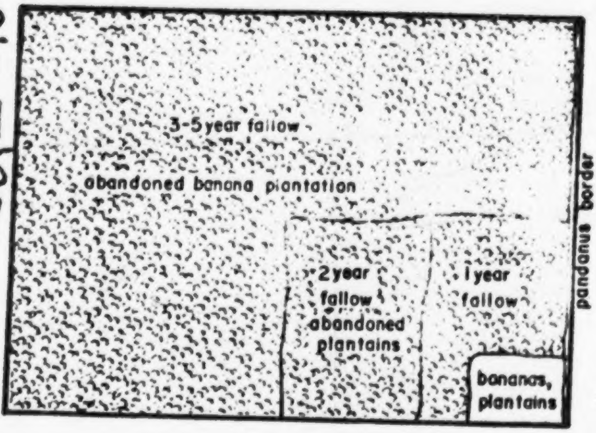
(Coconut Coverage: 75% Mature Palms; 25% Replanted Palms.)

88: Thaman K-5 (1967-1973) 1978 OU9 Tonga OU9
Tongatapu

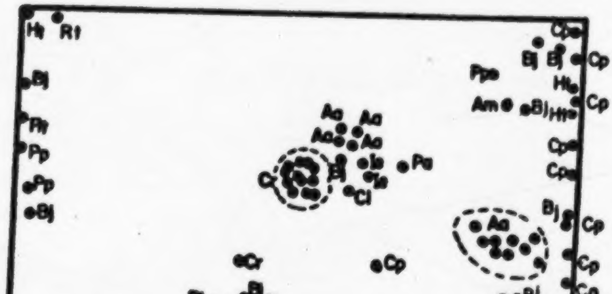
Figure 27. SAMPLE BUSH ALLOTMENT NO. 38

Location: Houma Area: 8.26 Acres

102
311
241
245
137


3-5 year fallow
abandoned banana plantation
2 year fallow abandoned plantains
1 year fallow
bananas, plantains
pandanus border

Distribution of Major Crops


Ht
Rt
Bj
Pp
Cp
Am
Aa
Cr
Cl
Pa
Hi
Ml

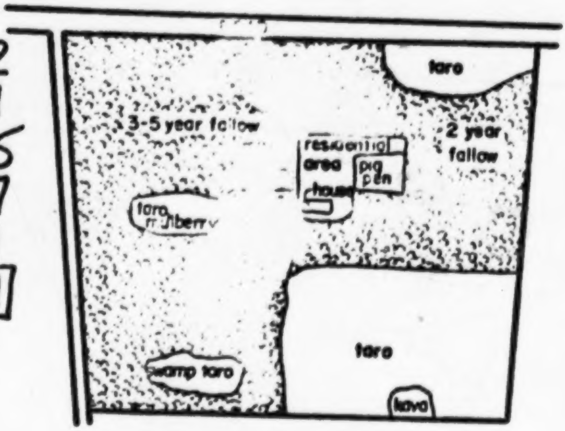
Distribution of Important Tree Species

(Coconut Coverage: 10% Mature Palms; 5% Replanted Palms.)

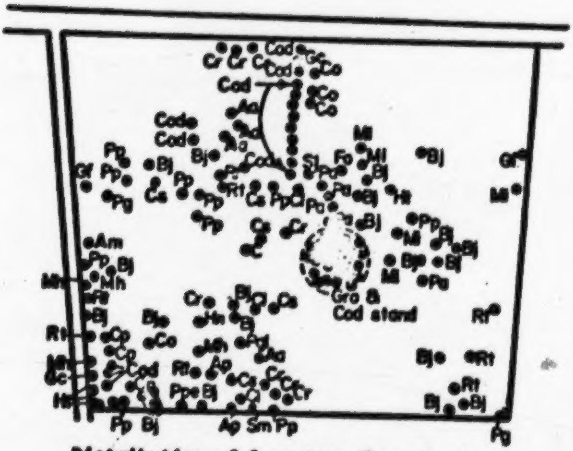
Figure 28. SAMPLE BUSH ALLOTMENT NO. 39

Location: Houma Area: 8.26 Acres

102
●241
245
137
311
[351]


taro
3-5 year fallow
residential area
pig pen
house
2 year fallow
taro mulberry
taro
swamp taro
kava

Distribution of Major Crops


Cod
Cr
Co
Bj
Pp
Pg
Mi
Rt
Am
Mh
Cs
Ap
Sm
Gro & Cod stand

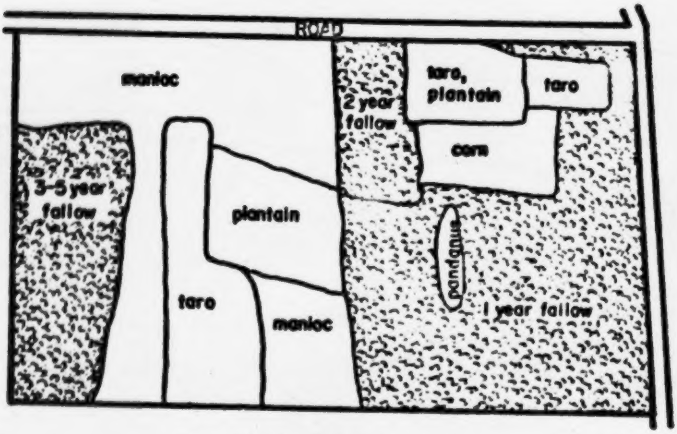
Distribution of Important Tree Species
(Coconut Coverage: 75% Mature Palms; 10% Replanted Palms.)

88: Thaman K-5 (1967-1973) 1978 OU9 Tonga OU9
Tongatapu

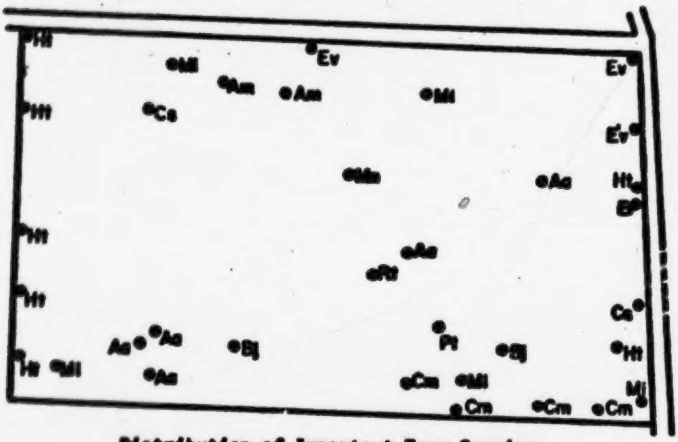
Figure 29. SAMPLE BUSH ALLOTMENT NO. 45

Location: Tokomololo Area: 8.40 Acres

102
● 241
245
311
137


ROAD
manioc
3-5 year fallow
taro
plantain
manioc
2 year fallow
taro, plantain
taro
corn
pandanus
1 year fallow

Distribution of Major Crops


Ht
Mi
Ev
Am
Am
Mi
Ev
Ht
Cs
Ev
Mn
Ac
Ht
Ei
Ht
Ac
Rt
Ht
Cs
Ac
Ac
Bj
Pt
Bj
Ht
Ht
Mi
Ac
Cm
Mi
Mi
Cm
Cm
Cm

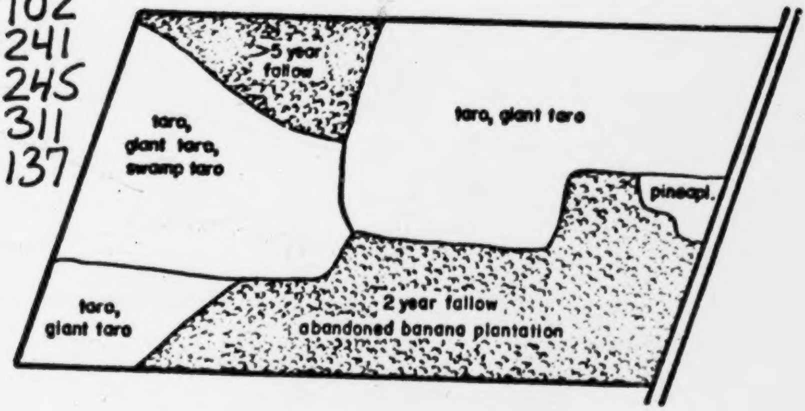
Distribution of Important Tree Species

(Coconut Coverage: 75% Mature Palms; 50% Replanted Palms.)

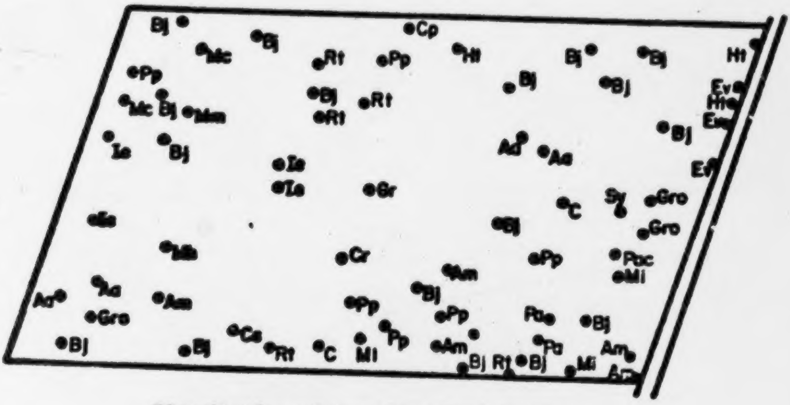
Figure 30. SAMPLE BUSH ALLOTMENT NO. 46

Location: Utulau Area: 8.25 Acres

102
241
245
311
137


>5 year fallow
taro, giant taro, swamp taro
taro, giant taro
pineapl.
taro, giant taro
2 year fallow
abandoned banana plantation

Distribution of Major Crops


Bj
Bj
Cp
Mc
Rt
Pp
Ht
Bj
Bj
Ht
Pp
Bj
Bj
Ev
Mc
Bj
Mm
Bj
Rt
Rt
Ht
Ev
Ie
Bj
Ad
Aa
Bj
Ie
Ie
Gr
Ef
C
Sy
Gro
Bj
Gro
Mh
Cr
Pp
Pac
Am
Mi
Ad
Aa
Am
Bj
Gro
Pp
Pp
Pa
Bj
Bj
Cs
Rt
C
Mi
Pp
Am
Pa
Am
Bj
Bj
Rt
Bj
Mi

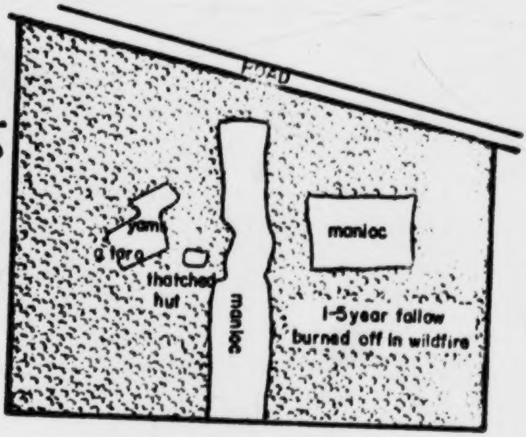
Distribution of Important Tree Species

(Coconut Coverage: 75% Mature Palms; 5% Replanted Palms.)

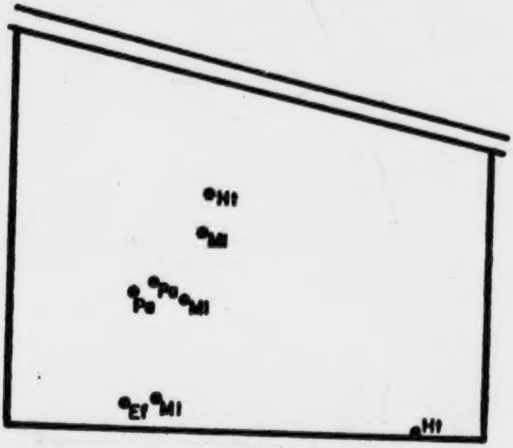
Figure 31. **SAMPLE BUSH ALLOTMENT NO. 53**

Location: Vaini **Area: 8.30 Acres**

102
241
245
311
137
[351]


ROAD
yams
a taro
thatched hut
manioc
manioc
1-5year fallow
burned off in wildfire

Distribution of Major Crops

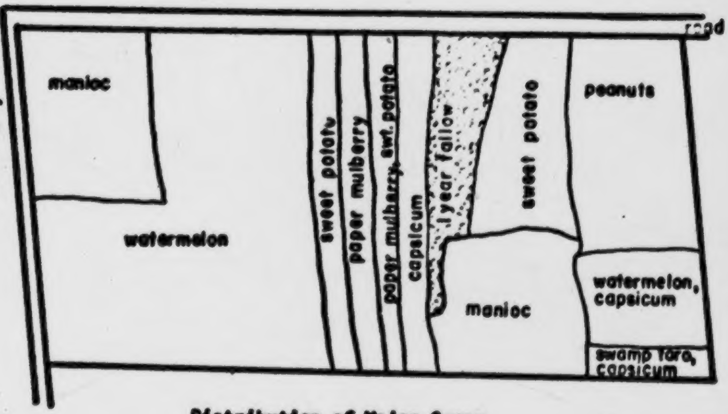

Ht
Mi
Pa
Pa
Mi
Ef
Mi
Ht

Distribution of Important Tree Species
(Coconut Coverage: 25% Mature Palms; 10% Replanted Palms.)

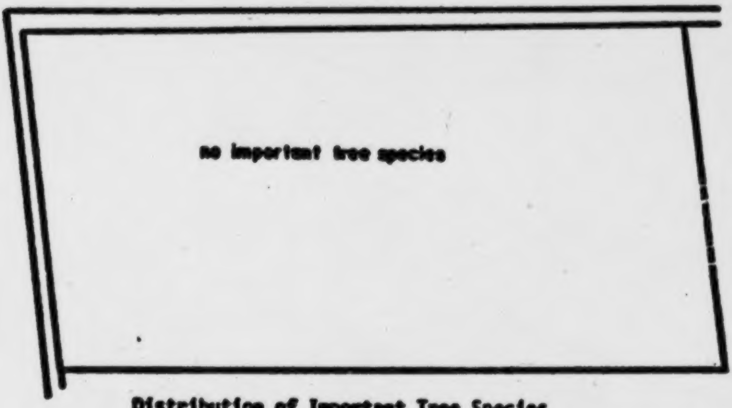
Figure 32. SAMPLE BUSH ALLOTMENT NO. 56

Location: Vaini Area: 8.25 Acres

102
241
245
311
137


road
manioc
watermelon
sweet potato
paper mulberry
paper mulberry, swt. potato
capsicum
1 year fallow
sweet potato
peanuts
manioc
watermelon, capsicum
swamp taro, capsicum

Distribution of Major Crops


no important tree species

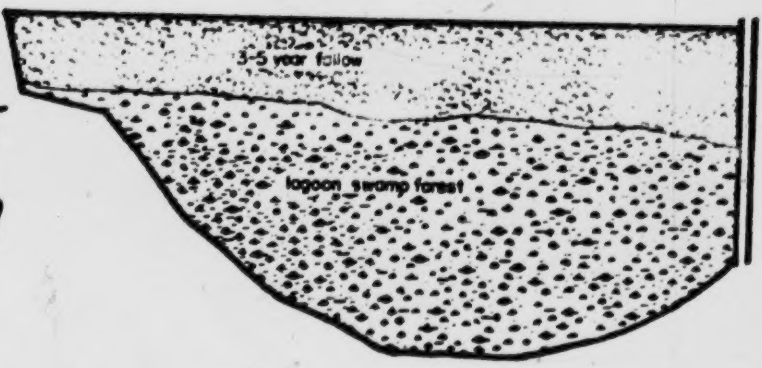
Distribution of Important Tree Species

(Coconut Coverage: No Mature Palms; 100% Replanted Palms.)

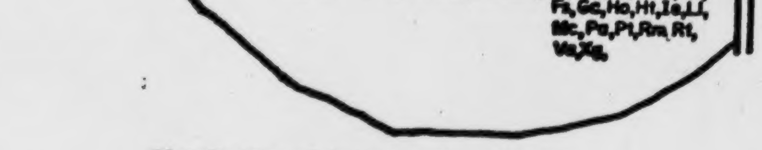
Figure 33. SAMPLE BUSH ALLOTMENT NO. 60

Location: Folaha Area: 6.28 Acres

102
241
245
311
137


3-5 year fallow
lagoon swamp forest

Distribution of Major Crops


eCo
lagoon swamp forest, including:Az,Bc,Cl,Cmn,Ea,
Fs,Gc,Ho,Ht,Ie,Ll,
Mc,Pa,Pt,Rm,Rt,
Va,Xg,

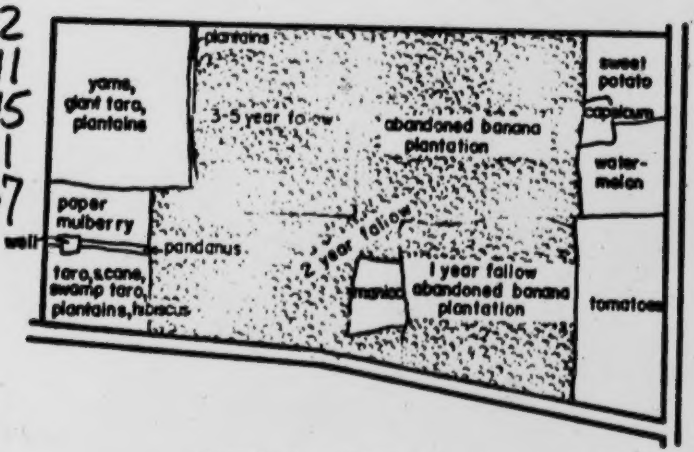
Distribution of Important Tree Species

(Coconut Coverage: 100% Mature Palms on Useable Portion of Allotment.)

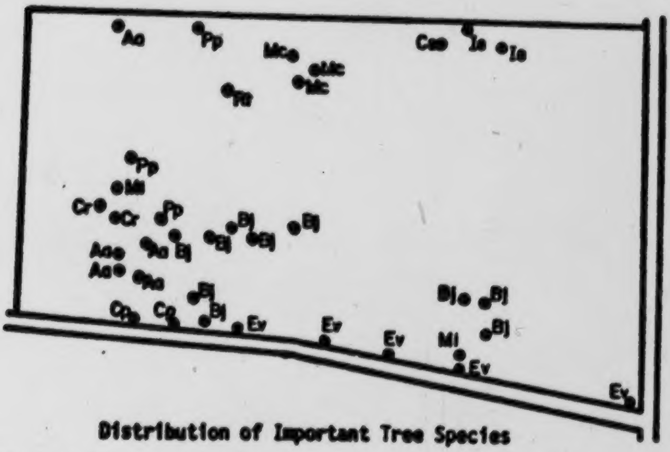
102
● 241
245
311
137

Figure 34. SAMPLE BUSH ALLOTMENT NO. 62

Location: Longoteme Area: 8.25 Acres


plantains
yams, giant taro, plantains
3-5 year fallow
abandoned banana plantation
sweet potato
capsicum
water-melon
paper mulberry
well
pandanus
2 year fallow
taro, & cane, swamp taro, plantains, hibiscus
manioc
1 year fallow abandoned banana plantation
tomatoes

Distribution of Major Crops


Ao
Pp
Mc
Mc
Mc
Fit
Cas
Is
Is
Pp
Mi
Cr
Cr
Pp
Bj
Bj
Bj
Bj
Bj
Aa
Aa
Aa
Aa
Bj
Bj
Cp
Cp
Ev
Er
Ev
Mi
Ev
Bj
Bj
Bj
Ev

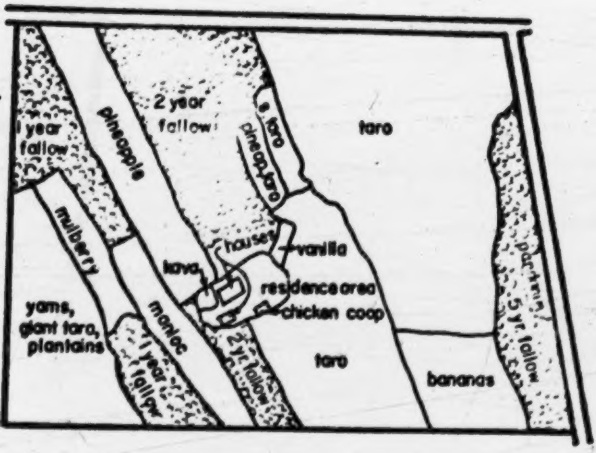
Distribution of Important Tree Species

(Coconut Coverage: 75% Mature Palms; 25% Replanted Palms.)

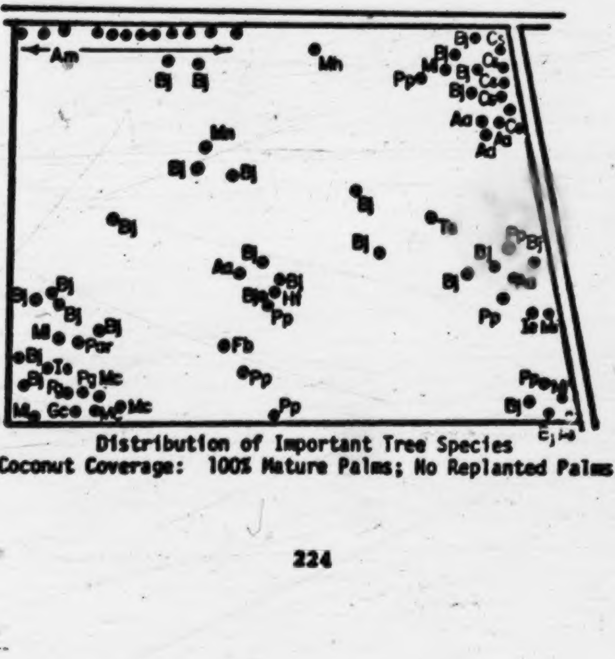
Figure 35. ~~SAMPLE BUSH ALLOTMENT NO. 67~~

Location: Vaini 'uta Area: 8.25 Acres

102
● 241
245
311
137
[351]


2 year
fallow
taro
1 year
fallow
pineapple
taro
pineapple, taro
house
vanilla
kava
residence area
chicken coop
mulberry
manioc
yams,
giant taro,
plantains
1 year
fallow
2 yr. fallow
taro
bananas
partly 5 yr. fallow

Distribution of Major Crops

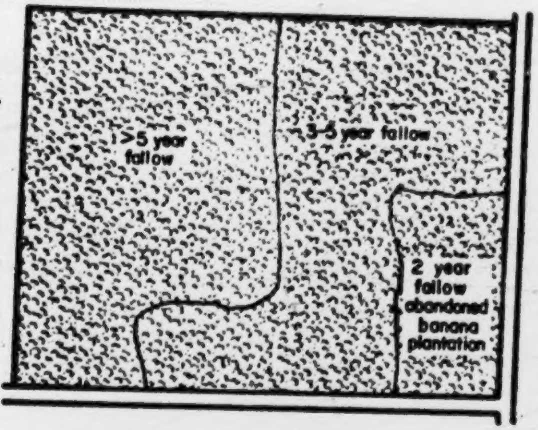

Am
Bj
Mn
Cs
Pp
Mi
Aa
Ad
Te
Hi
Fb
Par
Mc
Pg
Gc
Ms

Distribution of Important Tree Species
(Coconut Coverage: 100% Mature Palms; No Replanted Palms.)

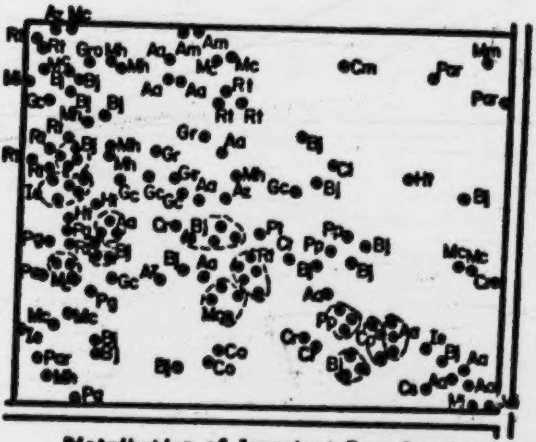
Figure 36. SAMPLE BUSH ALLOTMENT NO. 69

Location: Fua'amotu Area: 8.25 Acres

102
241
245
311
137


>5 year fallow
3-5 year fallow
2 year fallow abandoned banana plantation
3
2

Distribution of Major Crops

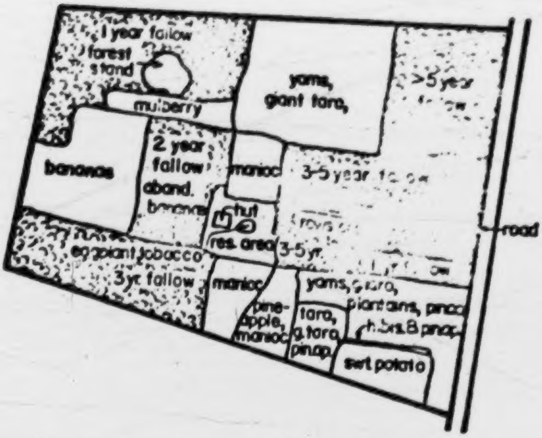

Az
Mc
Rt
Gr
Mh
Aa
Am
Mc
Cm
Par
Mn
Bj
Gc
Gr
Cl
Hf
Pp
Cr
Ma
Co
Ca
Cf
Pg
Is
It

Distribution of Important Tree Species
(Coconut Coverage: 100% Mature Palms; No Replanted Palms.)

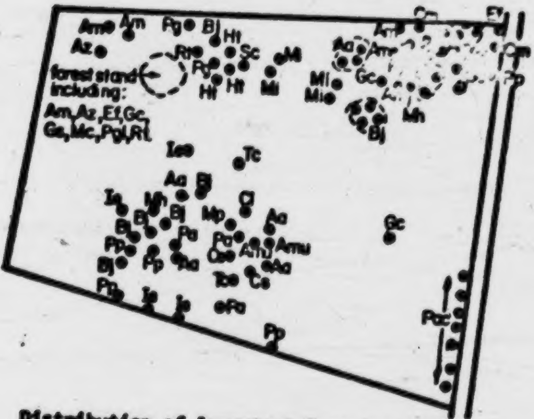
Figure 37. SAMPLE BUSH ALLOTMENT NO. 71

Location: Ha'asini Area: 8.01 Acres

102
241
245
311
137
[351]


1 year fallow
forest stand
mulberry
yams, giant taro,
>5 year fallow
bananas
2 year fallow
aband. bananas
manioc
3-5 year fallow
hut
res. area
3-5 yr.
eggplant tobacco
3 yr. fallow
manioc
yams, g. taro,
plantains, pinap.
pine-apple, manioc
taro, g. taro pinap.
swt potato
road

Distribution of Major Crops

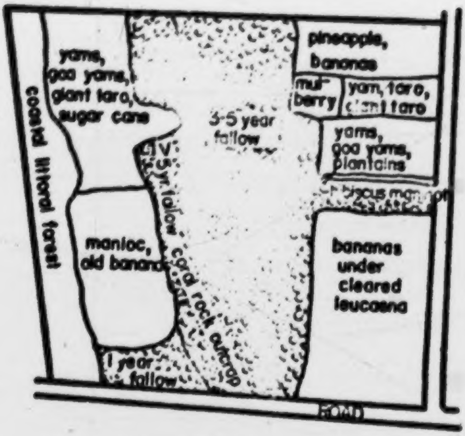

Am
Am
Pg
Bj
Ht
Az
Rt
Sc
Mi
Aa
Am
Am
Cm
Ef
Cm
forest stand including:
Am, Az, Ef, Gc, Gs, Mc, Pgl, Rt
Pg
Ht
Ht
Mi
Mi
Mi
Gc
Pp
Mh
Bj
Ie
Tc
Aa
Bj
Ie
Mh
Bj
Bj
Cl
Mp
Aa
Bj
Pa
Pa
Amu
Pp
Cse
Amu
Bj
Pp
Aa
Aa
Gc
Tce
Cs
Pp
Ie
Ie
Pa
Pp
Pac

Distribution of Important Tree Species
(Coconut Coverage: 10% Mature Palms; 5% Replanted Palms.)

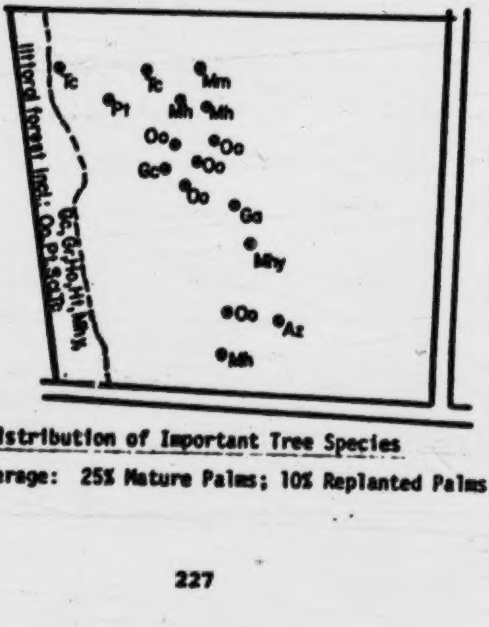
Figure 38. SAMPLE BUSH ALLOTMENT NO. 72

Location: Lavengatonga Area: 8.10 Acres

102
● 241
245
311
137


coastal littoral forest
yams,
goa yams,
giant taro,
sugar cane
manioc,
old bananas
1 year
fallow
5 yr. fallow
coral rock outcrop
3-5 year
fallow
pineapple,
bananas
mul-
berry
yam, taro,
giant taro
yams,
goa yams,
plantains
hibiscus mangrove
bananas
under
cleared
leucaena
ROAD

Distribution of Major Crops


littoral forest incl: Oo, Pi, Sc, Tc
Gc, Gr, Ho, Hi, Mh, Ma
Tc
Tc
Mm
Pi
Mh
Mh
Oo
Oo
Gc
Oo
Oo
Ga
Mhy
Oo
Az
Mh

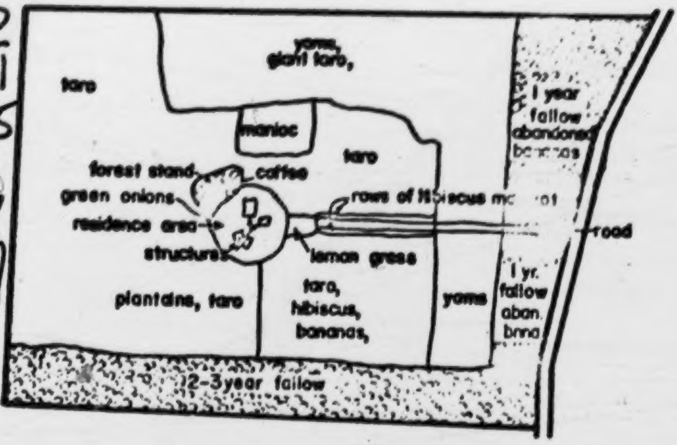
Distribution of Important Tree Species

(Coconut Coverage: 25% Mature Palms; 10% Replanted Palms.)

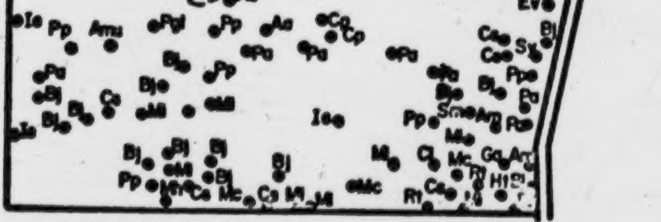
Figure 39. SAMPLE BUSH ALLOTMENT NO. 84

Location: Lapaha Area: 10.00 Acres

102
241
245
311
137
[351]


yams, giant taro,
taro
manioc
taro
forest stand
coffee
green onions
rows of hibiscus
residence area
structures
lemon grass
road
1 year fallow abandoned bananas
1 yr. fallow aban. bnna
plantains, taro
taro, hibiscus, bananas,
yams
2-3year fallow

Distribution of Major Crops


Pp
Bj
Sy
Ev
Ca
Ie
Mi
Ma
stand stand including: Am,Di,Ef,Et,Gc,Gc, Ga,Pa,Rt
Cp
Aa
Am
Ev
Amu
Pa
Cs
Sy
Pp
Sm
Mc
Rt
Ga
Cl
Hi

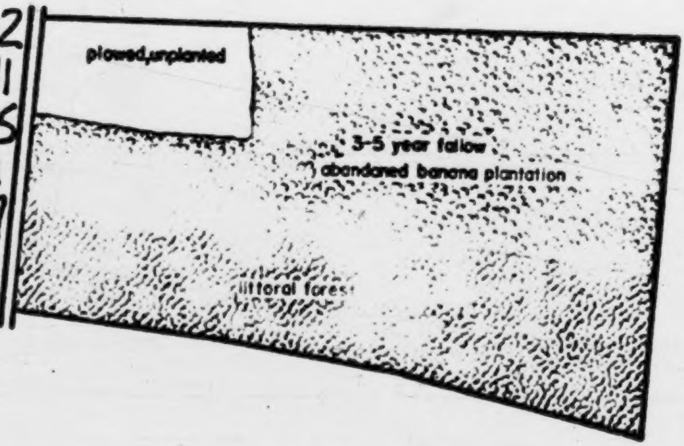
Distribution of Important Tree Species

(Coconut Coverage: 50% Mature Palms; No Replanted Palms.

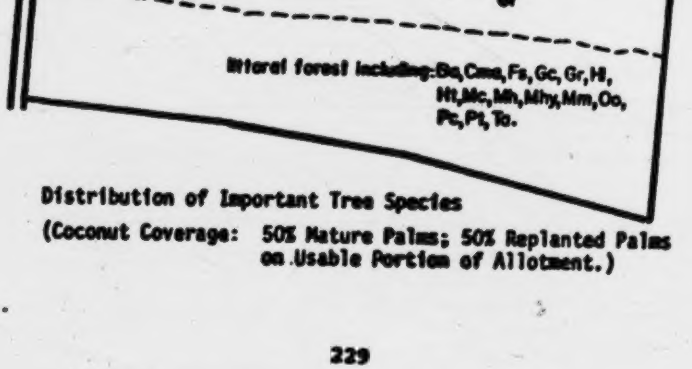
Figure 40. SAMPLE BUSH ALLOTMENT NO. 87

Location: Lapaha 'uta Area: 8.25 Acres

102
241
245
311
137


plowed,unplanted
3-5 year fallow
abandoned banana plantation
littoral forest

Distribution of Major Crops

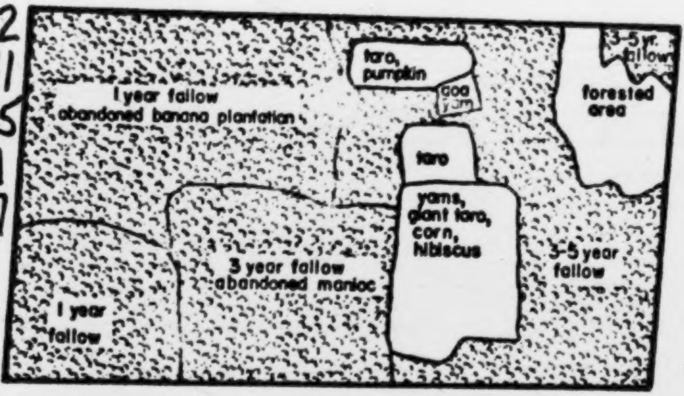

Mc
Mc
Ht
Ht
Mi
Mc
Mc
Mc
Mc
Mc
Mc
Ga
Pm
Ga
Pw
Gr
Gr
littoral forest including: Bo,Cma,Fs,Gc,Gr,Hi,
Ht,Mc,Mh,Mhy,Mm,Oo,
Pc,Pi,Ta.

Distribution of Important Tree Species
(Coconut Coverage: 50% Mature Palms; 50% Replanted Palms on Usable Portion of Allotment.)

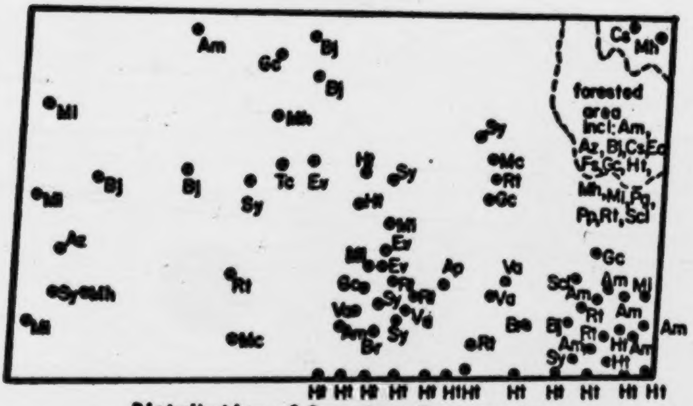
Figure 41. SAMPLE BUSH ALLOTMENT NO. 101

Location: Talafo'ou Area: 8.25 Acres

102
241
245
311
137


taro, pumpkin
goa yam
3-5 yr. fallow
forested area
1 year fallow abandoned banana plantation
taro
yams, giant taro, corn, hibiscus
3 year fallow abandoned maniac
3-5 year fallow
1 year fallow

Distribution of Major Crops

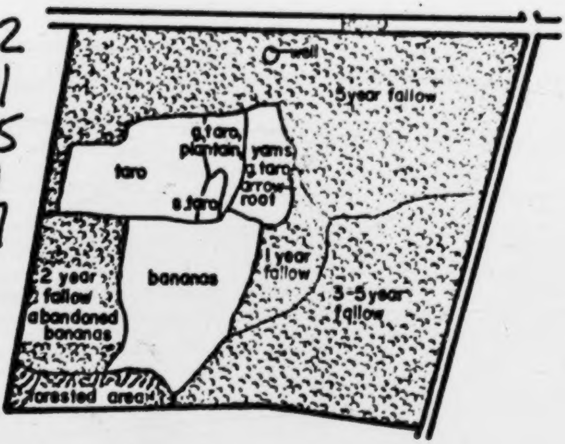

Am
Gc
Bj
Bj
Ml
Mh
Cs
Mh
forested area incl: Am, Az, Bj, Cs, Ec, Fs, Gc, Ht, Mh, Ml, Pg, Pp, Rt, Scl
Sy
Mc
Rt
Gc
Bj
Bj
Sy
Tc
Ev
Ht
Sy
Ht
Ml
Ml
Ev
Az
Ml
Ev
Rt
Sy Mh
Gc
Va
Rt
Sy
Ap
Va
Va
Ml
Mc
Am
Br
Sy
Br
Rt
Scl
Gc
Am
Ml
Am
Rt
Am
Bj
Rt
Am
Ht
Am
Sy
Ht
Am
Ht Ht Ht Ht Ht Ht Ht Ht Ht Ht Ht Ht

Distribution of Important Tree Species
(Coconut Coverage: 10% Mature Palms; 50% Replanted Palms.)

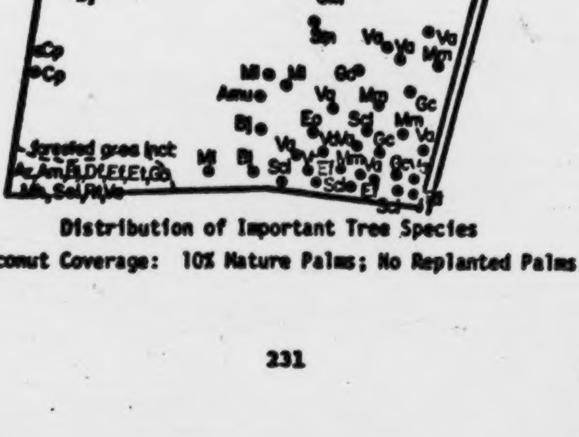
Figure 42. SAMPLE BUSH ALLOTMENT NO. 103

Location: Hoi Area: 8.26 Acres

102
241
245
311
137


well
5year fallow
g.taro,
plantain
yams
g.taro
arrowroot
taro
s.taro
bananas
1 year
fallow
3-5year
fallow
2 year
fallow
abandoned
bananas
forested area

Distribution of Major Crops


Rt
Rt
Bt
Mc
Bj
Ml
Bj
Ml
Ml
Bj
Bj
Am
Gr
Gr
Gr
Ec
Bj
Et
Et
Gr
Et
Ec
Bj
Ec
Et
Bj
Bj
Bj
Pa
Pa
Bj
Cm
Sm
Va
Va
Va
Mm
Cp
Cp
Ml
Ml
Gc
Amu
Va
Mp
Gc
Bj
Ep
Scl
Mm
Va
Va
Gc
Va
Va
Ml
Bj
Scl
Et
Mm
Va
Scl
Et
Scl
forested area incl.
Ac,Am,Bj,Dt,Et,Et,Gb
Mp, Sol,Pt,Va

Distribution of Important Tree Species
(Coconut Coverage: 10% Mature Palms; No Replanted Palms.)

88: Thaman K-5 (1967-1973) 1978 OU9 Tonga OU9 Tongatapu

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241
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128

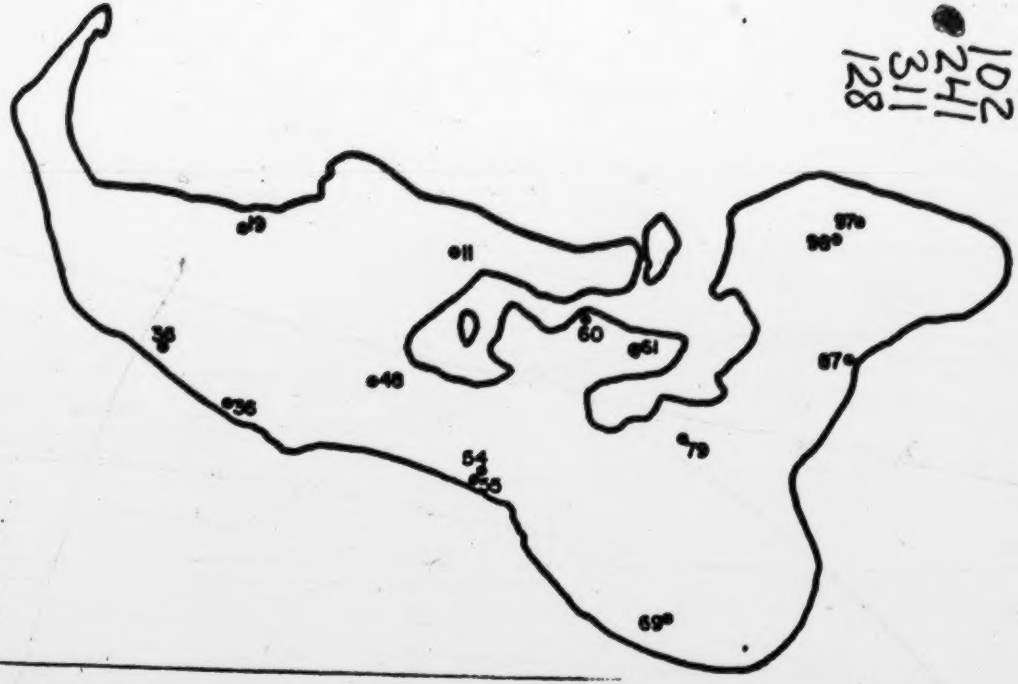

Figure 43. Outline map of Tongatapu showing the locations and sample numbers of the 14 uncultivated allotments from the sample survey of 101 bush allotments. Such maps were prepared for each item in the survey of bush allotments.

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101 allotments, 14 were not cropped at all (Table 29). If only those 87 allotments under cultivation are considered, the average cultivated area becomes 3.2 acres (1.3 hectares) per allotment, an average of 40 percent of the allotment.

Table 29: Frequency of specific percentages of cultivation (subsistence and commercial combined) on 101 sample bush allotments.

% of allotment Cultivated	100.00	93.75	87.50	81.25	75.00	68.75	62.50	56.25	50.00	43.75	37.50	31.25	25.00	18.75	12.50	6.25	0.00	TOTAL
Number of Allotments	0	2	3	2	3	4	7	2	6	7	12	7	7	12	7	6	14	101

On ten allotments, 75 percent or more of the land was cultivated (Table 29); the explanations (of which there were often more than one for a given allotment) obtained from informants or through observation were: in four cases, the allotments were undersized comprising 3.1, 4.8, 4.9, 6.8, acres (1.2, 1.9, 2.0 and 2.8 hectares) respectively;

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in three cases, there was more than one person utilizing the allotment; in two cases, the allotment holder lived on or next to the allotment; two allotments were devoted to commercial production, with the land being plowed on a frequent basis; two holders felt that they were just "energetic" (ivi lahi); and, in one case, the holder belonged to a toungāue of 18 members which worked on his allotment periodically.

On the 14 uncultivated allotments, a number of explanations for the lack of cultivation were also obtained (usually more than one for a given allotment): nine had unprofitable, possibly diseased banana plantations; 8 consisted largely of coastal littoral forest or swamp forest with marginal soils; the holders of six were currently cultivating at least one other allotment; the holders of two lived in Nuku'alofa and held wage-paying jobs; the holders of two were working overseas; the holders of two had died and the widows were not cultivating the land; and one allotment had been burned by wildfire. The uncultivated allotments seem to show slight concentrations along the swampy north coast and the rocky south coast (Figure 43). Similar explanations were given for the underutilization of the 13 allotments where only 12.5 percent and 6.25 percent of the area was cropped. Of these 12 were used only for subsistence cultivation, although nine had abandoned banana plantations.

311 Grazing occurs mainly on hereditary estates or lease-
233 holdings, and out of the sample of 101 bush allotments only
one had any grazing land, approximately 3 acres (1.2
[245] hectares). Like some of the larger plantations, the
[137] allotment was partially fenced, was well planted with
coconut palms and scattered citrus, and other useful trees
with an understory dominated by *Paspalum conjugatum*
(*vailima*), *Elephantopus mollis*, *Psidium guajava* (*kuava*),
Stachytarpheta urticaefolia (*iku'ikuma*), and *Dryopteris*
000 *invisa* (*hulufe*). The practice of setting aside pasture
land will possibly become more common as a result of
initiation of the Cattle Subsidy Scheme in 1971.

241 With respect to cultivated land, it was often
difficult to differentiate between subsistence and commer-
241 cial crops. Bananas, watermelons, pineapples, garden
438 vegetables, and peanuts are grown primarily for export or
439 local sale but are occasionally cultivated for home use.
Conversely, many of the important subsistence crops, such
as yams, taro, plantains, and even manioc are often produced
128 for export and local sale. In order to simplify the
241 already complicated inventory scheme, it was decided to
tabulate as commercial crops all species such as bananas,
watermelons, and pineapples, that are commonly grown
commercially and to tabulate yams, taro, manioc, etc. as
241 subsistence crops. On this basis, of the total acreage
of 101 sample allotments, 30 percent was in subsistence

241 crops, 4 percent in commercial crops, and 1 percent had both intercropped. Of the 87 allotments which were cultivated, all had subsistence crops, whereas only 31 allotments had commercial crops (Table 30).

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Table 30: Frequency and area of specified types of cropping, pasture, and fallow on 101 sample bush allotments.

Cropping Type	No. of Allotments	Ave. Acreage (Hectares) per Allotment		Total Acreage (Hectares)		% of Total Acreage
Subsistence	87	2.4	(0.9)	233.9	(96.7)	30%
Commercial	31	0.3	(0.1)	29.0	(11.7)	4%
Sub/com.	10	0.1	(<0.1)	7.6	(3.1)	1%
Total. Cult.	87	2.7	(1.1)	275.5	(111.5)	34%
Pasture	1	<0.1	(<0.1)	3.1	(1.3)	0%
Fallow	101	5.2	(2.1)	527.7	(213.6)	65%
Total Sample	101	8.0	(3.2)	806.3	(326.3)	100%

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Major Staple Crops

The frequency of occurrence and estimated acreages of major staple crops as dominants for the 101 sample allotments were obtained from inventories of all crops present and by pacing plots of staple crops (Table 31).

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Table 31. Frequency and area as dominants of specified staple crops on 101 sampled bush allotments.

Crop	Frequency Occurrence	Total Acreage as Dominant Crop (Hectares)	% of Total Sample Acreage	% of Subsistence Acreage
Manioc	73	91 (37)	11	37
Yams	53	52 (21)	7	21
American taro	51	59 (24)	7	24
Sweet potato	15	8 (3)	1	3
Swamp taro	14	8 (3)	1	3
Goa yam	8	3 (1)	<1	1
American and swamp taro	7	4 (2)	<1	2
[245] Plantain	7	4 (2)	<1	2
Giant taro	1	1 (<1)	<1	1

In the case of mixed plots of American and swamp taro, it was not possible, in a number of cases, to decide which plant was dominant. In the case of plantains, Goa yams and, to some extent, taro, the frequency of occurrence and total acreage of these crops would be considerably higher, except for the fact that they are usually (especially in the case of plantains and giant taro) intercropped with yams and other crops and are only

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occasionally planted alone as dominants. Nevertheless, Table 31 does give a good indication of the crops most widely cultivated as dominants during 1971.

241 None of these staple crops seem to be concentrated in specific areas of Tongatapu.

Supplementary Food Crops

Throughout the matrix of dominant staple crops and bush-fallow vegetation are found a variety of supplementary food plants which play an important role in the diet. [125] Because most of these are intercropped with the staple crops or found in bush fallow vegetation, the survey tabulated their frequency and abundance rather than the area occupied. 241 245 The papaya or *lesi* (*Carica papaya*) is the most widespread supplementary food plant, occurring on 88 of the sample bush allotments (Table 32). It is generally found either intercropped with other subsistence crops or as a volunteer in bush fallow. Three allotments had rows of papayas in small plantations, 40 allotments had at least 10 trees, and 45 had 1 to 9 trees.

241 In the cases of *si* (*Cordyline terminalis*), chili pepper or *polo fifisi* (*Capsicum frutescens*), and the cherry *tomato* or *temata vao* (*Lycopersicon esculentum* var. *cerasiforme*), it may be debated as to whether or not these are indeed "cultivated plants," because they are so commonly found as volunteers. All three species are widespread on

Table 32. Frequency of occurrence specified supplementary food crops found as non-dominants on 101 bush allotments.

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Plant	Number of Allotments
Papaya	88
Cordyline	68
Chile pepper	60
*Bananas	59
*Plantains	48
Edible hibiscus	36
*Pineapple	31
Sugar cane	30
*Pata banana	28
Cherry tomato	19
Pumpkin	17
Kava	14
Garden vegetables	14
Corn	10
Green onions	4
Coffee	3
Lemon grass	2
Amorphophallus	2
Granadilla	1

* Present as isolated or small groups of plants and discussed in detail under commercial crops.

241 bush allotments, usually amongst the secondary vegetation or as ruderals, and are occasionally planted or protected [245] in cultivated plots. A further difficulty arises in the case of *Cordyline terminalis*, which is planted as borders along roads or around houses, and has both edible and non-edible varieties. Unfortunately, during the study of the bush allotments, no distinction was made between these varieties.

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241 Bananas, including *pata*, plantains, and pineapples are important supplementary food crops as well as commercial crops. On a majority of the sample allotments they were intercropped with dominant staples, planted in small homogeneous patches or along borders of other crops or along paths. Of all the allotments where bananas were present (Table 32), only 15 had commercial plantings, none of which were *pata* bananas. In the case of plantains, only 7 allotments had homogeneous, obviously commercial stands. Similarly, out of the 31 allotments where pineapples were present, only 12 had homogeneous patches.

[262] Edible hibiscus or *pele* (*Hibiscus manihot*) and different varieties of taro constitute the main vegetable greens consumed by the average Tongan. This hibiscus was cultivated on 36 sample allotments (Table 32), of which 20 had more than 20 plants, 2 had 5 to 20 plants, and 3 had 1 to 5 plants. It was either intercropped with other subsistence crops, planted in small homogeneous patches, or along borders of cultivated areas or paths.

241 borders of cultivated areas or paths.

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249 Of the 30 allotments on which sugar cane or to (Saccharum officinarum) was found, 11 had more than 20 plants, 14 had 5 to 20, and 5 had 1 to 5 plants. It is rarely planted in continuous patches and is generally found planted randomly among other subsistence crops or along borders of paths or cropped areas.

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244 Pumpkins or hina (Curcurbita pepo) were planted as a continuous crop on only 1 allotment; on 16 others they were either interplanted amongst other crops or found amongst secondary vegetation in recently fallowed areas.

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249 Kava (Piper methysticum) roots are used in the preparation of the traditional beverage known by the same name. On 5 allotments, it was cultivated in small homogeneous stands of over 15 individual plants; 4 allotments had 5 to 15 plants, and 4 had 1 to 5 plants. One allotment had a large patch about one-half acre (one-fifth hectare) in size. When not cultivated in homogeneous stands it is generally intercropped with other subsistence crops.

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244 Garden vegetables were present on 14 allotments, 6 of which had contiguous plots (>1/10 acre), indicating possible commercial cropping (Table 33). Tomatoes or temata (Lycopersicon esculentum), bell peppers or polo (Capsicum annuum) and green beans or piini (Phaseolus vulgaris) were the only ones which seemed to have been grown on a commercial basis. Cabbage or kapisi (Brassica oleracea var.

Table 33. Frequency of occurrence of specified garden vegetables on 101 bush allotments.

Crop	Frequency Occurrence
Tomatoes	9
Bell pepper	8
Green beans	5
Cabbage	4
Carrots	4
Lettuce	4
Cucumbers	3
Chinese cabbage	2
Radishes	1
Beets	1
Eggplant	1

capitata), carrots or kaloti (Daucus carota), lettuce or letisi (Lactuca sativa), cucumbers or kiukamipā (Cucumis sativa), Chinese cabbage or kapisi siaina (Brassica pekinensis), radishes or latisi (Raphanus sativa), beets or pitiluti (Beta vulgaris), and eggplant or paingani (Solanum melongena) were all found present on allotments in "non-commercial" quantities in at least one instance each. In most cases, they were planted together in small vegetable gardens. In some instances, they were cultivated close to dwellings on the bush allotment.

241 Corn or *koane* (*Zea mays*) was planted alone on about
243 one-half acre (one-fifth hectare) of one allotment as a commercial crop. In the remaining 9 cases, it was intercropped with taro or giant taro, planted around the borders of yam patches, or in small mixed vegetable gardens.

241 Green onions or *onioni Tonga* (*Allium ascalonicum*) are
244 one of the most important herbs in Tongan cooking. On 3 of
[263] the 4 sample allotments where green onions were present, they were planted in well-ordered rows or homogeneous patches; in only one case were they planted amongst other subsistence crops.

241 Coffee or *kofi* (*Coffea arabica*) was found planted in
245 the shade of small groves of trees on 2 allotments and under scattered trees on another.

241 Lemon grass or *moengālō* (*Cymbopogon citratus*), the
249 leaves of which are used to brew tea, is generally found on town allotments, but was also cultivated in a small patch near a dwelling on 1 bush allotment and planted along a path through another allotment.

137 *Teve* (*Amorphophallus campanulatus*), an aroid, formerly
241 an important subsistence crop in certain areas of the
Pacific (Massal and Barrau, 1956: 6), was found on only 2
[26] of the sample allotments. In both cases, it was uncultivated and, according to informants, eaten only in times of famine.

241 Granadilla or pasiona (Passiflora quadrangularis) was
245 found on only 1 of the sample allotments along a trail through one-year bush fallow vegetation.

241 None of the supplementary crops seemed to be localized in particular regions of Tongatapu.

Important Non-Food Crops

Throughout the matrix of major staple crops and secondary vegetation, there are also a considerable number
[125] of important non-food crops (Table 34). The survey of these, like that of supplementary food plants, emphasized frequency and abundance with a secondary concern for the areas occupied by the few species which are planted alone in homogeneous plots.

241 The most widespread non-food plant which is cultivated
247 or at least protected on bush allotments is pandanus
[285] (Pandanus spp.). The leaves or lou'akau are used as fiber for weaving baskets, fine mats, and other plaited material. These species are more bush-like than the common screwpine or fā (Pandanus tectorius) and are found as borders, alone in homogeneous plots, amongst secondary vegetation as relics and volunteers, and in coastal and swamp forests on many allotments. Of the 76 sample allotments where pandanus was present, 32 had more than 25 plants, 21 had 10 to 25 plants, and 23 had less than 10. Of the 32 allotments with more than 25 plants, 4 had solid plantings of Pandanus averaging about .02 acres (.01 hectares).

241 247 248 249 **Table 34. Frequency of occurrence of specified non-food plants on 101 bush allotments.**

Plant	Number of Allotments
Pandanus	76
Paper Mulberry	38
Bamboo	11
Heliconia	9
Cycad	7
Job's tears	6
Hedychium	6
Miscanthus	5
Polynesian Arrowroot	4
Alyxia	4
Cotton	3
Tobacco	2
Tumeric	2
Evodia	2

241 248 Paper mulberry or *hiapo* (*Broussonetia papyrifera*) is second to *Pandanus* in frequency but occupies more area. It was present on 38 sample allotments and on half of these was the dominant crop on plots averaging about 0.40 acres (.16 hectares). On the other allotments it was interplanted amongst other crops or existed as a volunteer in bush fallow. Such was the case on an allotment near Lapaha,

241 248 where an extensive planting of paper mulberry had been completely overgrown by a dense stand of Leucaena leucocephala, while still retaining its value for use in the preparation of tapa cloth. Paper mulberry is traditionally an integral crop in the bush fallow cropping sequence.

241 249 Bamboo (Bambusa vulgaris) has two important varieties, pitu, the taller, stronger variety and kofe, the smaller variety. Four allotments had discrete stands (three of kofe and one of pitu); on the other 6, bamboo was generally amongst secondary vegetation. It is valued for general construction or handicraft work.

Sword grass or kaho (Miscanthus floridulus) was present on 1 allotment as a discrete stand and on 5 in scattered concentrations. Like pitu and kofe, it is valued for general construction and for handicrafts.

A bird-of-paradise-like plant, known locally as loufao or loufusi faikakai (Heliconia sp.), was found in isolated clonal clusters on 9 sample allotments where it was planted or protected. The leaves are used to wrap pudding (faikakai).

The cycad or longolongo (Cycas circinalis) was found on 7 allotments around dwellings, along paths, around small cemeteries, or amongst secondary vegetation. In most cases, it seems to have been deliberately planted, either as an ornamental or for its leaves which are used as a festive
[262] decoration. The seeds are also eaten, after thorough

241 249 [262] preparation, in times of food shortage.

Job's tears or *hana* (*Coix lachryma-jobi*) was found planted on 2 allotments in discrete stands and as a volunteer on 4 others. It is increasingly cultivated for production of seed necklaces and other handicrafts.

Tevunga (*Hedychium coronarium*), the leaves and roots of which are used to scent coconut oil (*lolo Tonga*), was found in cultivation around dwellings on 6 allotments. It also occasionally escapes and becomes naturalized.

Polynesian arrowroot or *mahoa'a* (*Tacca leontopetaloides*) was found planted alone on a plot of 0.30 acres (0.12 hectares) on 1 allotment. On the 3 other allotments, it was either intercropped with yams or among secondary vegetation. In the past, it seems to have been grown more widely to prepare paste for tapa making and for occasional use as an edible starch.

Maile (*Alyxia stellata*) leaves are used to make leis, sashes, and decorations for festive occasions. On 3 bush allotments it was found in a wild state; on another, it was cultivated or protected near a temporary dwelling.

241 248 Cotton or *vavae Tonga* (*Gossypium brasiliense*) was present on three of the 101 sample allotments. On one, more than 20 plants were planted along the border between two bush allotments. On the other two, individual plants were found near dwellings.

241 249 Tobacco or *tapaka* (*Nicotiana tabacum*) was on one allot-

241 249 ment as a small stand near a temporary dwelling and on another as a carefully cultivated plot approximately one-eighth acre (0.05 hectare) in area.

Turmeric or ango (Curcuma longa) was found on two allotments in a wild state. It is generally protected owing to the value of its rhizome for the preparation of a yellow dye (enga) and various medicines.

Uhi (Evodia hortensis f. simplicifolia) was on 2 sample allotments as isolated bushes, which were either cultivated or protected for medicinal use.

241 There are, no doubt, additional valuable non-food plants on Tongatapu bush allotments not included in the 101 sample allotments.

Commercial Crops

241 128 Such crops as bananas and plantains, watermelons, peanuts, rock melons, vanilla, and most garden vegetables are classified here as commercial crops, as they are all commonly cultivated for either export or local sale. Nevertheless, it should be stressed that they are also cultivated on a subsistence basis. Where these crops were present in commercial quantities, 1/10 acre or more, acreage estimates were made; otherwise presence was merely noted (Table 35).

245 241 As these data show, commercial bananas or siaine Ha'amoa (Musa sapientum) are the most widespread commercial crop. In almost all cases, bananas were planted alone in

241 Table 35. Frequency of occurrence and acreage of specified
245 crops when present in commercial quantities on 101 sample
244 allotments.

Crop	Number of Allotments	Total Acreage (Hectares)	% of Sample Acreage	% of Commercial Acreage
Bananas	15	15.2 (6.2)	1.8	42
Watermelons	4	6.1 (2.5)	0.8	17
Plantains	5	4.6 (1.8)	0.6	13
Pineapples	7	3.8 (1.5)	0.5	11
Garden vegetables	6	2.3 (0.9)	0.3	6
Peanuts	4	1.5 (0.6)	0.2	4
Rock melons	2	1.5 (0.6)	0.2	4
Corn	1	0.5 (0.2)	0.1	2
Vanilla	1	0.3 (0.1	<0.1	1

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241 orderly rows according to Tonga Produce Board recommendations. In four cases, however, the plantations were poorly maintained and ceased to be productive on a commercial basis. In addition to these plantations in a poor state of maintenance, 67 percent of the sample allotments had [137] abandoned banana plantations. Most of these plantations were probably abandoned due to black-leaf-streak fungus (Mycosphaerella fijiensis) and bunchy-top virus; the former has been particularly severe since 1968.

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245 Plantains or hopa (Musa paradisiaca) like bananas, are susceptible to black-leaf-streak and bunchy top diseases, but there were no abandoned plantain plantations on the sample allotments.

241
244 Watermelons or meleni (Citrullus vulgaris) are generally grown alone on large tracts of plowed land. Occasionally, they are also intercropped with yams, corn, or manioc.

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245 The pineapple or faina (Ananas comosus) is generally planted alone, although in one instance it was planted under manioc.

241
244 Garden vegetables, were present on only 6 allotments where they were planted on contiguous plots (>1/10 acre) indicating possible commercial cropping. Only three crops were obviously grown commercially; these were tomatoes or temata (Lycopersicon esculentum), bell pepper or polo (Capsicum annuum),and green beans or piini (Phaseolus vulgaris). They were generally found planted alone. There was one mixed planting of bell peppers, green beans, and bananas.

Peanuts or pinati (Arachis hypogaea) accounted for 4 percent of the commercial acreage and were planted alone on plowed plots. On two allotments , peanuts had been recently harvested.

The cantaloupe, rock melon or meleni maka (Cucumis melo var. cantalupensis), which the King of Tonga, Taufa'ahau Tupou IV, has championed as having considerable

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244 promise as an export crop, was found on 2 percent of the sample allotments, comprising 4 percent of the commercial acreage. In one instance, it was planted alone and, in another, was planted together with manioc.

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[235] Corn or _koane_ (_Zea mays_) was found in one instance in a large homogeneous stand of approximately 0.5 acres (0.2 hectares). Commercial corn growing on Tongatapu seems to be increasing owing to the establishment of a chicken feed industry, which has offered to buy increasing amounts of dried corn from farmers.

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245 Vanilla or _vanila_ (_Vanilla planifolia_) was present on only one of the sample allotments. There were approximately 40 individual plants, each supported by a physic nut tree or _fiki_ (_Jatropha curcas_). These vanilla plants, like many others that have been recently planted on Tongatapu, were not yet in production.

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Nature of Intercropping

One of the major foci of the survey of bush allotments was the nature of intercropping practices. The primary focus was on major staple and commercial crops. Supplementary crops are infrequently intercropped with major crops and are more often planted as borders on or around dwellings on bush allotments.

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244 Yams (_'ufi_) are generally the first crop planted in a recently cleared area and it is in the yam garden or _ma'ala_ where intercropping is most prevalent. In the 53 instances

241 where yams were present on the 101 sample bush allotments,
244 in only seven cases were they planted alone. Yams were planted with: giant taro (*kape*) in 41 instances; plantains (*hopa*) in 15 instances; American taro (*talo Futuna* or *talo tea*) in 13 instances; bananas (*siaine*) in four instances; Goa yam (*'ufilei*) and Polynesian arrowroot (*mahoa'a*) in two instances each; and, swamp taro (*talo Tonga*) and watermelons (*meleni*) in one instance each. Tongan informants generally said that yams were rarely planted without giant taro and that plantains were often planted in the same plot (in 13 cases both giant taro and plantains were intercropped with yams on the same plot). The general practice is to plant the giant taro and plantains in rows approximately 15 to 30 feet apart, with the yams planted in between. American taro is also frequently planted with yams, giant taro, and plantains. Bananas in some cases take the place of or are planted in addition to the plantains in association with yams. The practice of planting Goa yams or Polynesian arrowroot along the borders of the yam patch was probably more common in the past. In some cases, Goa yams are planted around the bases of giant taro and plantains which serve as trellises.

Of the 53 allotments where American taro was present, it was planted alone in 25 instances; was planted with giant taro in 18 instances; plantains in 18 instances; swamp taro in seven instances; paper mulberry (*hiapo*) in three

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instances; sweet potatoes (kumala) twice; and once with pumpkins (hina). American taro is often planted after yams have been harvested, and the giant taro and plantains, which were originally planted in association with yams, remain among the more recently planted taro. Plantains are also often planted as a follow-on crop to yams. As with any intercropping pattern, there are many variations, and sweet potatoes, paper mulberry or even pumpkins are sometimes planted along with taro after the yam harvest.

Swamp taro, which was present on 21 sample allotments, was planted alone in four instances; with American taro in seven instances; with giant taro in six instances; with plantains in four instances; with paper mulberry in three instances; with kava in one instance; and with both Goa yam and pineapple in one instance. The associations formed with swamp taro seem to be very similar to those formed with American taro. According to Tongan informants, swamp taro intercropped with paper mulberry, kava, Goa yam, or pineapple are common variations.

Manioc (manioke), which was present on 73 sample allotments, was found planted alone in 61 instances; was intercropped with giant taro and bananas in three instances each; with plantains and paper mulberry in two instances each; and with pineapple in one instance. In most of intercropping cases, the manioc seemed to have been planted after the other plants.

241 244 Sweet potatoes (kumala), which were present on 15 allotments, were planted alone in 11 instances and were intercropped once with giant taro, once with bananas, once with manioc and once with a paper mulberry.

The Goa yam ('ufilei), which was present on eight allotments, in two instances was intercropped with giant taro, taro, and bananas; once with giant taro, plantains and bananas; and once with American taro. In the remaining four cases, it was planted alone.

241 [654] [655] The Agricultural Department and Tonga Produce Board generally discourage intercropping of the major commercial crops. However, of the sample bush allotments, 9 had commercial crops intercropped.

241 245 Of the 15 commercial banana plantations on the sample bush allotments, in only six cases was there intercropping. In one instance, the entire banana plantation was underplanted with American taro. In the other instances, manioc, Goa yams, yams, or American taro were planted under portions of the plantation. The actual percentage of the total banana acreage that was intercropped comprised only 4.8 acres (1.9 hectares) or 32.5 percent of the total commercial banana acreage.

241 244 Watermelons, which were present on four sample allotments, were intercropped in only one case; this was with yams.

241 245 Pineapples, which were present in commercial quant-

241 245 ities on seven allotments, were intercropped in only one case; this was with manioc.

241 245 The only other cases of commercial intercropping were one case where capsicum and green beans were planted together and another where cantaloupes (meleni maka) were planted with manioc.

241 178 Although intercropping, as part of commercial cropping, is discouraged, this practice continues on bush allotments because emphasis on subsistence production is still great and commercial crops are generally of secondary importance.

Important Tree Species

241 245 A considerable number of important tree species are either cultivated or protected on bush allotments throughout Tongatapu.

Coconut Palms

241 245 125 128 In the case of coconut palms, estimated cover was used rather than counts of individual trees. The intervals used for estimating cover were: 100%, 75%, 50%, 25%, 10%, 5% and 0% (see Appendix A).A Cover was defined as being 100% where palms were planted densely enough to total about 60 per acre (150 per hectare). The head of the Coconut Replanting Scheme considered this to be a fair estimate of the number of palms which, if planted throughout an allotment, would provide optimum yields (Liyanage, D.V., 1971, personal communication). Although individual

A[See Category 125, pp. 350-358--Analyst.]

241 palms were not counted as part of the survey, after the
245 completion of the survey, the palms on 16 of the sample
128 allotments were counted to determine the accuracy of the
125 estimates (Table 36).

241 Table 36. Inventories of coconut palms on 16 selected
245 bush allotments and the corresponding survey estimates.

Allotment No.	Acreage	(Hectares)	Estimated Coverage	Estimated Number	Actual Count
1	7.58	(3.07)	25%	115	141
2	8.25	(3.34)	75%	375	336
3	8.26	(3.34)	75%	375	354
6	6.41	(2.59)	50%	194	286
7	8.00	(3.24)	25%	121	172
8	4.22	(1.71)	25%	64	116
9	8.47	(3.43)	25%	128	234
10	8.36	(3.38)	50%	253	245
12	4.76	(1.93)	75%	216	211
23	8.25	(3.34)	25%	125	135
27	5.01	(2.03)	100%	303	427
33	4.10	(1.66)	50%	124	169
34	6.22	(2.52)	75%	376	296
59	8.27	(3.35)	75%	376	452
75	8.25	(3.34)	25%	125	155
77	8.25	(3.34)	10%	100	70

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Results of the survey(Table 37) indicate that the coconut palm is the dominant feature on most bush allotments. A majority have at least 200 palms and some 500 or more. The median coverage was 50 percent(Table 37) or approximately 250 palms on an 8 1/4 acre allotment.

Table 37. Number of sample allotments (out of 101) having specified covers of mature and replanted coconuts.

	100%	75%	50%	25%	10%	5%	0%	Total
Mature palms	8	22	21	30	13	4	3	101
Replanted palms	3	7	12	13	9	12	45	101

On 51 of the 101 sample allotments, coconut palms were planted in rows similar to a commercial plantation, with an average distance of about 30 feet between rows and 20 to 30 feet between trees in a given row. On the other allotments, the palms were planted more haphazardly. In both cases, however, the palms were usually unevenly distributed throughout the allotment, with portions being left open for yams and other sun-loving plants.

Only in the case of allotments with less than 10 percent mature coconut coverage did there seem to be any geographical localization. These areas of low-density coconut coverage, which are possibly a result of frequent wildfires, were concentrated south of Vaini and in north-central Hahake south-west of Kolonga(Figure 8).A

A[See Category 116, pp. 38-A--38-B--Analyst.]

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[654] Only 56 of the 101 sample allotments had recently planted coconuts. The median coverage for these allotments was only 25 percent. Because of senility and declining productivity of most palms on Tongatapu, the Coconut Replanting Scheme has subsidized the planting of new palms. Although a majority of allotments had some replanted palms, in very few instances were they well maintained. Nevertheless, there seemed to be sufficient replanting to insure the coconut palm's future as the dominant tree and most valuable plant on the bush allotments.

Fruit Trees

In addition to coconut palms, there were 25 species of fruit trees among the plant associations on the 101
[125] sample bush allotments(Table 38). For most species, numbers of individuals were tabulated, but individual Citrus species were difficult to differentiate and only presence or absence was noted.

The most common trees were mango (Mangifera indica), citrus trees (Citrus spp.), tava(Pometia pinnata), breadfruit or mei (Artocarpus altilis) and Tahitian chestnut or ifi (Inocarpus edulis), all of which were present on over 50 percent of the sample bush allotments. In most cases, these trees are protected and preserved during the clearing
[313] of secondary vegetation for cultivation. However, there is a growing tendency to utilize many of these important tree crops for firewood and timber.

Table 38. Frequency of occurrence of specified fruit trees on 101 bush allotments (individual *Citrus* trees were classified only as present or absent).

Scientific Name	Tongan Name	Present	5-9 Trees	10+ Trees
Mangifera indica	*mango*	79	27	9
Citrus spp.	*moli*	72	9	12
C. sinensis	*moli kai*	(49)	-	-
C. reticulata	*moli peli*	(43)	-	-
C. limon	*lemani*	(18)	-	-
C. sp.	*moli vaikeli*	(9)	-	-
C. maxima	*moli Tonga*	(7)	-	-
C. medica	*kola*	2	-	-
C. aurantifolia	*laimi*	(1)	-	-
C. aurantium	*moli mahi*	(1)	-	-
Pometia pinnata	*tava*	70	27	7
Artocarpus altilis	*mei*	66	19	13
Inocarpus edulis	*ifi*	55	8	1
Psidium guajava	*kuava*	53	8	26
Persea americana	*avoka*	38	3	0
Terminalia catappa	*telie*	17	1	2
Annona muricata	*'apele 'Initia*	16	0	0
Spondias dulcis	*vi*	13	0	0
Syzygium malaccense	*fekika*	11	0	0
Syzygium jambos	*fekika palangi*	2	0	0

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Table 38. Continued.

Scientific Name	Tongan Name	Present	5-9 Trees	10+ Trees
Theobroma cacao	*koko*	1	0	0
Anacardium occidentale	*apu*	1	0	0
Ficus carica	*fiki Palangi*	1	0	0
Malus pumila	*'apele Palangi*	1	0	0
Prunus persica	*piisi*	1	0	0

Mango, citrus trees, and breadfruit are found randomly scattered throughout bush allotments, as well as cultivated or preserved in small groves, often near dwellings. *Tava* and the Tahitian chestnut or *ifi* are found more often in a wild state, generally randomly scattered throughout, the allotment. Occasionally, these trees are planted or preserved as allotment boundary markers and in the past, before formal cadastral surveys, wild Tahitian chestnut trees, in particular, were common boundary markers.

The guava is also widespread on bush allotments but is considered to be more of a noxious weed than a valuable tree species and, although large trees are occasionally protected, especially around dwellings, guava is generally cleared together with the secondary vegetation before cropping. The figures in Table 38 include only large guava

[128]

241 245 [128] trees and not seedlings among the secondary vegetation. Almost all guava trees that were inventoried were found in older secondary vegetation.

Other common trees found on over 10 percent of the allotments were avocado or *avoka* (*Persea americana*), Indian almond or *telie* (*Terminalia catappa*), soursop or *'apele 'Initia* (*Annona muricata*), Polynesian vi-apple or *vi* *Spondias dulcis*), and Malay apple (*Syzygium malaccense*).

A number of more recently introduced fruit trees were observed on only one or two sample bush allotments: the rose apple or *fekika Palangi* (*Syzygium jambos*), cocoa or *koko* (*Theobroma cacao*), the cashew or *apu* (*Anacardium occidentale*), the edible fig or *fiki Palangi* (*Ficus carica*), the apple or *'apele Palangi* (*Malus pumila*), and the peach or *piisi* (*Prunus persica*). It is interesting to note that three of these six species are described by the suffix *Palangi* meaning European.

Fruit trees constitute a dominant feature on most bush allotments and are almost always, except in the case of the guava, planted or protected. The most important species continue to be the traditional species of Southeast Asian or Pacific origin, including mango, citrus, *tava*, breadfruit, Tahitian chestnut, Indian almond, soursop, vi-apple, and the Malay apple, together with a number of introductions from America, such as avocado and guava.

● 241 245 The more recently introduced exotics are less frequently cultivated on bush allotments and are generally found near dwellings.

241 137 Other Useful Trees

In addition to coconut palms and fruit trees, there are a great variety of other useful trees found on bush allotments (Table 39), the uses of which are described in Appendix E.[A] Only six species were found on over 50 percent of the sample allotments: koka (Bischofia javanica), tuitui (Aleurites moluccana), fau (Hibiscus tiliaceus), nonu (Morinda citrifolia), loupata (Macaranga harveyana), and tavahi (Rhus taitensis). All six seem to be native species, common to the Southeast Asia-Pacific region, and are generally found in secondary forests or primary littoral and swamp forests throughout Tongatapu. On bush allotments, they occasionally form contiguous stands but are more often scattered throughout the matrix of cultivated areas and secondary vegetation. Except in the cases of Hibiscus tiliaceus, Morinda citrifolia, and Macaranga harveyana, which are often removed, these trees are generally protected when secondary vegetation is cleared for cultivation. Hibiscus tiliaceus and Aleurites moluccana commonly serve as boundary markers on bush allotments.

Several other species were present on at least ten percent of the 101 bush allotments (Table 39). Of these, fā (Pandanus tectorius), fo'ui (Grewia crenata), kulukulu

[A] [See Category 116, pp. 377-431--Analyst.]

Table 39. Frequency of occurrence specified useful trees on 101 bush allotments.

Scientific Name	Tongan Name	Present	10-25 Trees	25+ Trees
Bischofia javanica	*koka*	88	43	2
Aleurites moluccana	*tuitui*	78	8	3
Hibiscus tiliaceus	*fau*	73	14	18
Morinda citrifolia	*nonu*	68	9	7
Macaranga harveyana	*loupata*	66	12	4
Rhus taitensis	*tavahi*	63	7	7
Grewia crenata	*fo'ui*	48	11	2
Erythrina variegata	*ngatae*	39	12	3
Pandanus tectorius	*fā*	33	2	7
Glochidion spp.	*malōlō, masikoka*	32	0	0
Ceiba pentandra	*vavae*	27	2	3
Santalum yasi	*ahi*	25	0	0
Alphitonia zizyphoides	*toi*	21	1	0
Cananga odorata	*mohokoi*	18	0	0
Pittosporum arborescens	*masi'aukava*	16	0	0
Vavaea amicorum	*ahivao*	16	3	4
Gyrocarpus americanus	*puko*	16	0	0
Elattostachys falcata	*ngatata*	15	4	2
Mortya macrophylla	*kulukulu*	15	4	1

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Table 39. Continued.

Scientific Name	Tongan Name	Present	10-25 Trees	25+ Trees
Adenanthera pavonina	lopa	15	0	1
Garcinia sessilis	heilala	15	0	0
Ficus spp.	masi'ata	14	1	0
Micromelum minutum	takafalu	14	1	8
Cerbera manghas	toto	10	3	1
Diospyros laterifolia	mapa	10	0	0
Jatropha curcas	fiki	9	3	3
Ervatamia orientalis	te'ete'emanu	9	1	0
Grevillea robusta	'oke	8	2	1
Syzygium corynacarpium	hehea	8	0	0
Xylosma orbiculatum	filimoto	8	1	0
Plumeria acuminata	kalosipani	7	1	0
Syzygium clusiasfolium	fekika vao	7	1	1
Ochrosia oppositifolia	fao	7	4	2
Trema orientalis	mangele	6	0	1
Dysoxylon forsteri	mo'ota	6	0	0
Elaeocarpus tonganus	ma'ama'alava	5	0	0
Geniostoma rupestre	te'epilo'a Maui	5	3	0
Excoecaria agallocha	feta'anu	5	0	3

Table 39. Continued.

Scientific Name	Tongan Name	Present	10-25 Trees	25+ Trees
Hernandia ovigera	*fotulona*	5	1	8
Garuga floribunda	*Manaui*	4	0	0
Barringtonia asiatica	*futu*	4	0	0
Parinarium glaberrimum	*pipi, pipi failolo*	4	0	0
Fagraea berteriana	*pua Tonga*	4	0	0
Diospyros ferrea	*kanume*	4	0	0
Ficus obliqua	*'ovava*	4	0	0
Calophyllum inophyllum	*feta'u*	4	0	1
Myristica hypargyraea	*kotone*	3	0	0
Xylocarpus granatum	*lekileki*	3	1	0
Planchonella costata	*kalaka*	3	0	0
Syzygium aromaticum	*sipaisi*	3	0	0
Burkella richii	*kau*	3	0	0
Desmodium umbellatum	*lala tahi*	3	1	0
Tournefortia argentea	*touhuni*	3	0	0
Casuarina equisetifolia	*toa*	2	0	0
Tarenna sambucina	*manonu*	2	0	0

Table 39. Continued.

Scientific Name	Tongan Name	Present	10-25 Trees	25+ Trees
Eucalyptus spp.	pulukamu	2	0	0
Homolanthus nutans	malamala'afonua	2	0	0
Aglaia saltatorum	langakali	2	0	0
Rhizophora spp.	tongo, tongolei	2	0	2
Syzygium neurocalyx	koli	1	0	0
Premna taitensis	volovalo	1	0	0
Lumnitzera littorea	hangale	1	0	0
Bruguiera conjugata	tongo	1	0	0
Phaleria disperma	huni	1	0	0
Bauhinia monandra	fehi	1	0	1
Melia azedarach	sita	1	0	0
Cedrela odorata	sita Palangi	1	0	1

(Myrtya macrophylla), malōlō or masikoka (Glochidion spp.), and masi'ata (Ficus spp.) were often present as remnants of coastal or swamp forest; on cultivatable portions of allotments they are often destroyed and used for firewood or other purposes. Toi (Alphitonia zizyphoides), masi'aukava (Pittosporum arborescens), ngatata (Elattostachys falcata), Mertya macrophylla, and Grewia crenata are found in remnant

241 137 stands of secondary forest (possibly primary forest in some cases). Ahivao (Vavaea amicorum) and takafalu (Micromelum minutum) are found both in secondary forest and in stands of Leucaena leucocephala. Those generally found as isolated individuals scattered throughout bush allotments are ngatae (Erythrina variegata), mohokoi (Cananga odorata), puko (Gyrocarpus americanus), lopa (Adenanthera pavonina), heilala (Garcinia sessilis), and ahi (Santalum yasi); these are all usually preserved when an area is cleared for cultivation. On one allotment, however, approximately 24 individual S. yasi trees were found. Some of the previously mentioned species such as Grewia crenata, Pandanus tectorius, Aliphitonia zizyphoides, Pittosporum arborescens, Myrtya macrophylla, and Ficus spp. are also occasionally found growing individually, although more [245] subject to removal. Erythrina variegata, Ceiba pentandra (vavae), and Cananga odorata are frequently deliberately planted, the former two along borders of, or as boundary markers, for bush allotments.

The remaining infrequent tree species, were found to be present on less than ten percent of the bush allotments (Table 39). Those infrequent tree species characteristically found in the coastal littoral forest association include toto (Cerbera manghas), fao (Ochrosia oppositifolia), fotulona (Hernandia ovigera), futu (Barringtonia asiatica), feta'u (Calophyllum inophyllum), kotone (Myristica hypargyraea), kalaka (Planchonella costata), lala tahi (Desmodium umbellatum), touhuni (Tournefortia argentea), and toa (Casuarina equisitefolia). A number of these species, C. manghas, H. ovigera, C. inophyllum and D. umbellatum, are also found in swamp forests along with feta'anu (Excoecaria agallocha), lekileki (Xylocarpus granatum), and hangale (Lumnitzera littorea); whereas, the mangrove forest generally consists of tongo or tongolei (Rhizophora spp. and Bruguiera conjugata). Allotments on which these trees were present were generally located along the north or south coasts of Tongatapu. Many of these species, with the exception of E. agallocha, X. granatum, Rhizophora spp., and B. conjugata, were found as protected individuals on cultivable portions of allotments.

The infrequent species found in mature secondary or primary forests include: mapa (Diospyros laterifolia), te'ete'amanu (Eryatamia orientalis), filimoto (Xylosma orbiculatum), fekikavao (Syzygium clusiaefolium), ma'ama'alava (Elaeocarpus tonganus), kanume (Diospyros ferrea), kau (Burkella richii), and langakali (Aglaia saltatorum). These species are generally found as members of small forest stands on parts of bush allotments which have not been utilized for at least ten years or more. In some cases, however, these species are also found as dispersed and protected individuals.

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The species which are more commonly found as dispersed individuals include *hehea* (*Syzygium corynocarpium*), *mo'ota* (*Dysoxylon forsteri*), *manaui* (*Garuga floribunda*), *pipi* or *pipi failolo* (*Parinarium glaberrimum*), *pua Tonga* (*Fagraea berteriana*), *koli* (*Syzygium neurocalyx*), and *volovalo* (*Premna taitensis*). Although these plants are also found as members of forest stands, they are more commonly present as individual trees that have been protected, especially near dwellings and along property lines. In no instances were there more than ten individuals of any of these species on a given allotment.

The native trees that are found infrequently on bush allotments, but do not seem to be protected, are *mangele* (*Trema orientalis*), *te'epilo 'a Maui* (*Geniostoma rupestre*), *'ovava* (*Ficus obliqua*), *manonu* (*Terenna sambucina*), and *malamala'afonua* (*Homolanthus nutans*). *Trema orientalis* and *H. nutans* seem to be pioneer species generally found in thickets; *G. rupestre* is generally found in seaside thickets on allotments near the lagoon or the southern windward coast. *Ficus obliqua*, which starts as a parasite, often on *Bischofia javanica*, is found occasionally on allotments throughout Tongatapu. *Terenna sambucina* is found in secondary forests throughout Tongatapu.

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The trees that were found in limited numbers in what seemed to be a purposely planted state were *fiki* (*Jatropha curcas*), *kalosipani* (*Plumeria acuminata*), *sipaisi*

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245 (Syzygium aromaticum), huni (Phaleria disperma), fehi (Bauhinia monandra), and sita (Melia azedarach). Jatropha curcas is commonly planted as a living fence and, on one sample allotment, to support vanilla. The other species are generally planted as borders near dwellings or around 137 small family cemeteries. Phaleria disperma is also found wild in coastal littoral forest, while M. azedarach is sometimes found as an escape.

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318 Three tree species that have been introduced by the Department of Agriculture as part of a reforestation program were also found on some of the sample allotments: silky oak or 'oke (Grevillea robusta) on eight allotments; Australian gum or pulukamu (Eucalyptus spp.) on two allotments; and cigar box cedar or sita Palangi (Cedrela odorata) on one allotment. 241 245 Extensive stands of G. robusta and C. odorata approximately seven years in age had been planted on one allotment.

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137 On the sample bush allotments there seems to be a lower concentration of useful trees in west central Hahake, between Vaini and Fua'amotu and in north central Hahake, southwest of Kolonga, presumably because of the high incidence of plowing and frequent wildfire.

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313 Although there is still a considerable diversity of valuable trees found throughout the cultivable area as well as in portions of coastal, swamp, and mangrove forests on Tongatapu bush allotments, the current shortage of timber

241 and firewood, together with the increasing use of the plow,
137 will undoubtedly bring about a further reduction of these
313 species. Trees such as *nukonuka* (*Decaspermum fruticosum*),
137 *tangato* (*Pleiogynium solanderi*),and *hea* (*Parinarium
insularum*) which, according to Tongan informants, were
common throughout Tongatapu in the past, were not encountered
137 in the sample of the 101 bush allotments. The greatest
245 reduction of the number of valuable tree species was
probably due to the rapid expansion of the banana industry
137 in the mid-1960's. The demand for banana cases led to the
313 uncontrolled milling of the timber resources of Tongatapu,
318 where most of the Kingdom's cases were produced until 1967.
As early as 1964, the Annual Report of the Minister of
Agriculture stated that:

> The situation in Tongatapu with regard to the felling of trees for the saw-mills is critical as the usual source of supplies [natural forests] have almost depleted [sic] and loggers have already started their attacks on useful trees such as mangoes, candlenut, etc. To make things worse the old feta'anu [*Excoecaria*] trees on the shore have also been used by millers which consequently will weaken the protection of the coasts and the shores against sea erosion (Government of Tonga, 1965: 21).

In 1968, the Agriculture Department reported that:

> ...the supply of logs on Tongatapu has already reached the critical level following the extermination of natural forests and in some cases useful tree crops also. As a result, most of the sawmillers operating around Tongatapu have moved to 'Eua Island where there is a more abundant supply of logs (Government of Tonga, 1969a: 13).

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313 Among the species that were most favored for milling are: tavahi (Rhus taitensis), toi (Alphitonia zizyphoides), tangato (Pleogynium solanderi), telie (Terminalia catappa), feta'u (Calophyllum inophyllum), fao (Ochrosia oppositifolia), mo'ota (Dysoxylon forsteri), ma'ama'alava (Elaeocarpus tonganus), and kotone (Myristica hypargyraea) (Government of Tonga, 1961: 13).

[438] In addition to lumbering, the need for firewood has also made heavy demands on the tree population. One of the major items sold at Talamahu Market in Nuku'alofa is firewood and on one Saturday the following species were being sold (starting with the most abundant): tongo (Rhizophora spp.), sialemohemohe (Leucaena leucocephala), koka (Bischofia javanica), toi (Alphitonia zizyphoides), loupata (Macaranga harveyana), tavahi (Rhus taitensis), ngatata (Elattostachys falcata), ifi (Inocarpus edulis), tava (Pometia pinnata), mango (Mangifera indica), and orange (Citrus sinesis).

Nature of Fallow Areas

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125 The survey of 101 sample bush allotments was also concerned with the extent, age and species composition of fallow vegetation. Prior to the survey, selected Tongan farmers were asked about the ages of different fallow areas and within each area the plant species were noted. This showed that a reasonably accurate estimate of the length of the fallow period could be based on species composition

241 (Table 40). During the survey, by using combinations of
125 species, each portion of fallow vegetation was classified
according to its approximate age; an estimate of the area
was made by pacing; and the species composition was re-
corded. The age classes that were used in the survey were:
241 1, 2, 3-5, 5-10, and over 10 year fallow. There is of
128 course considerable overlap of species between age classes,
and in different areas of the island, different species may
be dominant in a given age-class fallow association (Table
241 40). For example, in parts of the Hihifo or Western Dis-
128 trict, an area of 3-5 year fallow might have _Lantana_
137 _camara_, _Psidium guajava_, and _Paspalum conjugatum_ as
dominants; areas of 3-5 year fallow in Vahe Loto or the
Central District might have _Panicum maximum_ and _Indigofera_
suffruticosa as dominants whereas an area of the same age-
class in the Hahake or Eastern District might have _Leucaena_
leucocephala as the dominant. Finally, the age-class
intervals are not equal because, as the time of fallow
increases, it becomes increasingly difficult to estimate
the length of fallow accurately.

241 _Extent of Fallow Land_

The combined area for all fallow age-classes was 573
acres (232 hectares) or 71 percent of the total sample area
241 (Table 41). This is evidently a slight exaggeration,
128 because this estimate plus those for area of cultivated
land and pasture totaled 851 acres, 6 percent above the

[TEXT CONTINUED ON PAGE 278]

88: Thaman K-5 (1967-1973) 1978 OU9 Tonga OU9
Tongatapu

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Table 40. Species composition of specified age-classes of bush fallow (the asterisks * indicate those species, which either alone, in association with other species, or because of their state of maturity were major indicators of a specified age class; within each age-class, the species listed first are generally the earlier members of a given succession).

1-Year Fallow

**Portulaca oleracea*
**Euphorbia hirta*
**Commelina spp.*
**Oxalis corniculata*
**Cyperus rotundus*
**Kyllinga monocephala*
**Cassia tora*
**Sonchus oleraceus*
**Phaseolus semierectus*
**Erigeron sumatrensis*
**Vernonia cinerea*
**Emilia sonchifolia*
**Bidens pilosa*
**Physalis angulata*
**Solanum nigrum*
**Solanum uporo*

Sorghum halepense
Paspalum conjugatum
**Synedrella nodiflora*
Rhynchelytrum repens
Cenchrus echinatus
Indigofera suffruticosa
Sida rhombifolia
Canna indica
Panicum maximum
Stachytarpheta urticaefolia
Canavalia maritima
Pueraria lobata
Ipomoea gracilis
Triumfetta bartramia
Psidium guajava

Table 40. Continued.

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2-Year Fallow

Sorghum halepense
Paspalum conjugatum
**Synedrella nodiflora*
Mimosa pudica
Rhynchelytrum repens
Cenchrus echinatus
Indigofera suffruticosa
**Sida rhombifolia*
Canna indica
**Panicum maximum*
**Stachytarpheta urticaefolia*
Canavalia maritima
Pueraria lobata
Ipomoea gracilis
**Triumfetta bartramia*
**Psidium guajava*
**Passiflora foetida*
**Passiflora subpeltata*
**Elephantopus mollis*
**Dryopteris invisa*
**Melinis minutiflora*
**Lantana camara*
Leucaena leucocephala

3-5 Year Fallow

Paspalum conjugatum
Synedrella nodiflora
Indigofera suffruticosa
Sida rhombifolia
Panicum maximum
Pueraria lobata
Ipomoea gracilis
**Triumfetta bartramia*
**Psidium guajava*
Passiflora foetida
Passiflora subpeltata
Elephantopus mollis
Dryopteris invisa
Melinis minutiflora
**Lantana camara*
**Leucaena leucocephala*
**Digitaria pruriens*
**Dioscorea bulbifera*

Table 40. Continued.

3-5 Year Fallow (Continued)

*Solanum verbascifolium
*Passiflora maliformis
*Jasminum spp.
*Vavaea amicorum
*Micromelum minutum
*Morinda citrifolia
*Hibiscus tiliaceus
*Macaranga harveyana

5-10 Year Fallow

Paspalum conjugatum
Indigofera suffruticosa
Panicum maximum
Ipomoea gracilis
Triumfetta bartramia
*Psidium guajava
Dryopteris invisa
*Jasminum spp.
*Vavaea amicorum
Micromelum minutum
Morinda citrifolia
*Hibiscus tiliaceus
*Macaranga harveyana
Melinis minutiflora
*Lantana camara
*Leucaena leucocephala
Digitaria pruriens
Dioscorea bulbifera
Solanum verbascifolium
Passiflora maliformis
*Glochidion spp.
*Elattostachys falcata
*Grewia crenata
*Entada phaseoloides
*Piper puberulum
*Tarenna sambucina
*Trema orientalis

10 Year Fallow

Paspalum conjugatum
Dryopteris invisa
Digitaria pruriens
Passiflora maliformis
Jasminum spp.
Vavaea amicorum

Table 40. Continued

10 Year Fallow (Continued)

Micromelum minutum
Morinda citrifolia
**Hibiscus tiliaceus*
**Macaranga harveyana*
Glochidion spp.
**Elattostachys falcata*
**Grewia crenata*
Entada phaseoloides
Piper puberulum
**Tarenna sambucina*
**Mertya macrophylla*
**Bischofia javanica*
**Aleurites moluccana*
**Xylosma orbiculatum*
**Rhus taitensis*
**Ficus spp.*
**Syzygium clusiaefolium*
**Alphitonia zizyphoides*
**Ervatamia orientalis*
**Santalum yasi*
**Elaeocarpus tonganus*

Table 41. Proportion of fallow vegetation in specified age-classes

Age Class of Fallow	Acreage (Hectares)	%of Fallow Acreage	% of Total Sample Area
1 year	115 (47)	20	14
2 year	107 (43)	19	13
3-5 year	176 (71)	31	22
5-10 year	122 (50)	21	15
10 year	53 (21)	9	7
Total Fallow	573 (232)	100	71

241 actual total acreage of the 101 allotments.

128 Age of Fallow Land

241 [311] Approximately half of all land on the sample allotments had been under fallow for five years or less. A very low percentage of the sample acreage had been under fallow for over ten years, mostly uncultivable littoral or swamp forest. 241 137 Of the non-swamp areas under fallow for ten years or over, only 3 acres had dense forest stands and the balance had open secondary forests and thickets of Lantana camara or Psidium guajava. Fallow periods are too short for regeneration of the tropical lowland forest.

Species composition

The survey of the species comprising secondary vegetation attempted to determine both frequency of occurrence and dominance (Table 42).

241 137 125 128 These data are not highly accurate, for two reasons: firstly, most allotments were surveyed only once and the species composition of early pioneer species might vary considerably depending upon either the season or the time elapsed since a plot had been cleared for cultivation, weeded, or harvested; and secondly, in the latter stages of the survey, the author was able to recognize non-dominant species, which might have been overlooked during the earlier stages of the survey.

241 137 Many weedy species were present on at least 75 percent of the sample allotments (Table 42). Some of them, such as

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[128]

Table 42. Frequency and importance scores of species comprising secondary vegetation on 101 sample bush allotments (Importance scores are based on 3 points per allotment where a given species was considered dominant or co-dominant; 2 points if it was abundant but not dominant; and 1 point if it was simply present).

Scientific Name	Tongan Name	Frequency of occurrence per 101 allotments	Importance Score
Indigofera suffruticosa	*'akauveli*	99	240
Paspalum conjugatum	*vailima*	98	230
Sorghum halepense	*kola*	97	233
Synedrella nodiflora	*pakaka*	92	199
Sida rhombifolia	*te'ehoosi*	92	168
Cyperus rotundus	*pakopako*	91	219
Emilia sonchifolia	*fisipuna*	90	163
Lantana camara	*talatala*	90	220
Stachytarpheta urticaefolia	*iku'ikuma*	88	144
Mimosa pudica	*mateloi*	86	150
Dryopteris invisa	*hulufe*	85	152
Solanum verbascifolium	*pula*	85	144
Psidium guajava	*kuava*	81	161
Canna indica	*misimisi*	81	132
Panicum maximum	*saafa*	78	192
Commelina spp.	*kaningi*	77	122
Ipomoea gracilis	*fue*	76	138

Table 42. Continued.

Scientific Name	Tongan Name	Frequency occurrence	Importance Score
Passiflora subpeltata	vaine 'ae kuma	76	135
Bidens pilosa	fisi'uli	73	104
Canavalia maritima	lautolu'uta	72	119
Cenchrus echinatus	hefa	71	87
Sonchus oleraceus	longolongo'uha	70	90
Erigeron sumatrensis or Vernonia cinerea	fisipuna	62	92
Oxalis corniculata	kihikihi	60	74
Dioscorea bulbifera	hoi	59	74
Digitaria pruriens	mohuku'apopoa	57	110
Rhynchelytrum repens	salapona	54	93
Polypodium scholopendria	laufale	49	60
Pueraria lobata	aka	47	60
Phaseolus semierectus	piini kulokula	44	45
Kyllinga monocephala	pakopako 'aekuma	38	47
Melinis minutiflora	puakatau	37	75
Passiflora maliformis	vaine kai	36	57
Cassia tora	te'epulu	36	59
Elephantopus mollis	lauveveli	35	47
Euphorbia hirta	sakisi	28	37
Ageratum conyzoides	te'ekosi	28	44

Table 42. Continued.

Scientific Name	Tongan Name	Frequency occurrence	Importance Score
Leucaena leucocephala	sialemohmohe	27	58
Solanum uporo	polo'Tonga	26	33
Piper puberulum	kavakava'ulie	25	40
Nephrolepis hirsutula	hulufe	25	48
Portulaca oleracea	tamole	24	31
Entada phaseoloides	valai, sipi	21	22
Solanum nigrum	polo kai	20	20
Centella asiatica	tono	17	24
Jasminum spp.	tutu'uli	12	18
Physalis angulata	polo pa	9	9
Plantago major	filo	7	9
Achyranthes aspera	tamatama	7	9
Wedelia biflora	ate	6	16
Crotalaria mucronata	piisi, piini	6	6
Vigna marina	lautolu tahi	6	12
Acrostichum aureum	hakato	5	13
Colubrina asiatica	fiho'a	5	8
Coleus amboinicus	kaloni	4	4
Pogostemon neptoides	pasiole	2	2

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Paspalum conjugatum, *Synedrella nodiflora*, *Cyperus rotundus*, *Emilia sonchifolia*, *Commelina spp.*, *Bidens pilosa*, *Sonchus oleraceus*, *Erigeron sumatrensis*, *Vernonia cinerea*, *Oxalis corniculata*, *Phaseolus semierectus*, *Rhynchelytrum repens*, *Kyllinga monocephala*, *Cassia tora*, *Euphorbia hirta*, *Portulaca oleracea*, *Solanum uporo* *S. nigrum*, and *Physalis angulata* are found throughout Tongatapu as dominant pioneer species on freshly cleared or freshly harvested land.

Others, such as *Indigofera suffruticosa*, *Sida rhombifolia*, *Lantana camara*, *Stachytarpheta urticaefolia*, *Dryopteris invisa*, *Solanum verbascifolium*, *Psidium guajava*, *Panicum maximum*, *Digitaria pruriens*, *Melinis minutiflora*, and *Leucaena leucocephala*, are found as dominants in areas which have been under fallow from two years to over ten years. Some of the more important dominants, such as *Lantana camara*, *Panicum maximum*, *Psidium guajava*, and especially *Leucaena leucocephala*, do not rank quite as high on the frequency of occurrence scale as they do in the "total score" scale (Table 42). Although not as ubiquitous as some early pioneer species, these species tend to dominate the bush fallow landscape. *Panicum maximum*, *Sorghum halepense*, and *Leucaena leucocephala* are commonly found in aggressive stands with few other species present. Of the estimated fallow acreage of 574 acres found on the 101 sample bush allotments, relatively homogeneous stands of *P. maximum* accounted for approximately 19 percent of the

241 137 area; S. halepense 7 percent; and L. leucocephala 6 percent. In the case of P. maximum, 11 percent was in the one year age-class category; 24 percent in the two years; 52 percent in the three to five years; and 16 percent in the five to ten years. The respective acreages for S. halepense (which seem to indicate a slightly shorter fallow period) were: 61 percent, one year; 29 percent, two years; and 11 percent, a fallow period of from three to five years. Similar figures for L. leucocephala were: 25 percent, three to five years fallow and 75 percent, five to ten year fallow. Although Lantana camara and Psidium guajava often form dense thickets, they are not generally found in relatively pure stands like these three species.

In addition to the major dominants, a number of vines, lianas and other non-dominants were widespread in various stages of secondary regrowth. These include Ipomoea gracilis, Passiflora subpeltata, P. foetida, Canavalia maritima, Dioscorea bulbifera, Pueraria lobata, Passiflora maliformis, Piper puberulum, Centella asiatica, Entada phaseoloides, Jasminum spp., Achyranthes aspera, and Coleus amboinicus.

A number of members of the flora of the littoral and swamp forests often appeared among the secondary vegetation of coastal allotments. These species include Wedelia biflora, Vigna marina, Acrosticum aureum, and Colubrina asiatica.

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With the exception of coastal species, the only ones with localized distributional patterns were: pakopako (Cyperus rotundus), more common in the Hihifo or Western District; saafa (Panicum maximum), more common in the Vahe Loto or Central District and in Western Hahake than elsewhere; sialemohemohe (Leucaena leucocephala) and pula (Solanum verbascifolium), both more common in the Hahake District, especially in the coastal areas south of Kolonga, near the towns of Fatumu and Lavengatonga; and, te'epulu or tengafefeka (Cassia tora), which is most common in the Hahake district.

On the whole, the major weed and secondary vegetation species have a homogeneous distribution throughout Tongatapu. The great majority of them have been introduced since the time of European contact, with tropical America being the center of origin for most although there are also a number of Old World representatives (Merrill, 1945: 121-122).

Despite the detrimental effects that many of these species, such as Cyperus rotundus and Commelina spp., have on agricultural production, the group plays an important role in bush-fallow soil regeneration and many of the common weeds and secondary vegetation species are used for medicines, feeding livestock, handicrafts, or even for human food (Appendix E).[A] Noxious weeds such as Panicum maximum, Lantana camara, Psidium guajava, and Leucaena

[A] [See Category 137, pp. 377-431--Analyst.]

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leucocephala have made traditional hoe culture more difficult and have encouraged the use of the plow. On the other hand P. maximum is a useful pasture grass; P. guajava an edible fruit; and L. leucocephala is a source of livestock feed, firewood, and timber for general construction purposes, and its seeds are made into necklaces and other handicraft items. Others have proved of considerable utility: Cassia tora, Phaseolus semierectus, and Crotalaria mucronata, improve soil fertility; Sonchus oleraceus, Solanum nigrum, and Portulaca oleracea are often eaten as green vegetables; Bidens pilosa, Oxalis corniculata, Achyranthes aspera, and Centella asiatica are used medicinally; and Coleus amboinicus and Canna indica are used for scenting coconut oil and in the preparation of seed necklaces, respectively.

Most of these species seem to depend on man not only for their introduction but also for their continuing existence. By their very nature as secondary vegetation species, they depend largely upon man to open up suitable habitats. As the Tongan farmer removes the few remaining stands of native vegetation, these secondary species should become increasingly dominant.

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Agricultural Practices and Conditions

Inventories were also conducted of selected agricultural practices and conditions affecting the nature of plant assemblages on bush allotments. These included:

241 125 condition of crops, use of green manure or mulching, methods of clearing for cultivation, presence of agricultural improvements (such as houses or shacks, wells, transportation networks and fencing), and presence of livestock.

In evaluating husbandry practices associated with subsistence crops, manioc was treated separately, because 241 it generally requires less care. Of 81 sample allotments with subsistence crops other than manioc, 50 were well weeded, 19 unweeded, and 3 overtaken by bush. On 75 allotments with manioc, 3 were weeded and mulched, 14 well weeded, 46 unweeded, and 12 overtaken by bush. Yams, sweet potatoes, and plantains were generally well weeded; taro constituted the great majority of subsistence crops, apart from manioc, which were unweeded or overrun by bush. Taro requires little care and can compete with weeds and secondary vegetation. Manioc requires even less care and in only 17 of 75 cases was it well weeded; in 3 of these it was mulched with Sorghum halepense and in the remaining 58 it was unweeded or overtaken by bush.

Of 31 allotments containing commercial crops, 26 were well-weeded, 6 unweeded, and 2 overtaken by bush. Of the 6 unweeded commercial plots, 4 were banana plots on the verge of being unsuitable for export while the other two were pineapples and a vegetable garden with diseased bell peppers (Capsicum annuum) and green beans (Phaseolus vulgaris). In two cases pineapple patches were completely overtaken by

241 bush.

241 245 Of all commercial crops, coconut palms seem to receive the least care and on 42 of the 101 sample allotments there was evidence of wasted nuts rotting on the ground. There was also considerable evidence of rat damage to coconut palms; 8 allotments had numerous fallen nuts which had been gnawed by rats and another 23 allotments had some evidence of rat damage.

241 242 There were 7 cases where at least one-quarter acre of hyacinth bean (Dolichos lablab) had been planted as a green manure crop and another 13 cases where it was present in smaller concentrations. This is one of the green manure crops introduced by the Department of Agriculture.

241 As for preparation of land prior to cropping, there were 82 cases where burning was evident and 43 cases where
[654] plowing was evident. The government encourages plowing and discourages burning because it injures coconut palms and often causes wildfires, especially in Vahe Loto, the Central District.

241 361 Improvements which were found on the 101 allotments included 13 permanent residences and 13 temporary thatched huts. Where permanent homes were present, allotments were usually better maintained and had more cultivated trees and plants, such as garden vegetables, which require constant care. The temporary dwellings are generally used while guarding crops from theft or when a farmer or his family stay overnight at the bush allotment.

241 stay overnight at the bush allotment.

241 Wells were found on 6 allotments and a cement rain -
catchment tank was present on another. On 4 of these, there
312 were permanent dwellings and on 3, garden vegetables were
grown.

241 There were 11 allotments with copra driers; 7 of these
245 had permanent dwellings and two had substantial temporary
dwellings.

241 Good condition barbed-wire fencing was found around
417 parts of 10 allotments, poor condition fencing around 2,
and another 24 had some fencing along one side or across
241 the central portion of the allotment. In almost all cases,
fences were used to protect crops from livestock, particularly
241 horses. Although treated wood fenceposts are becoming
417 increasingly common, living fence posts such as _ngatae_
245 (_Erythrina variegata_) and _fiki_ (_Jatropha curcas_) are more
common.

241 As for accessibility, 89 allotments had some kind of
roads bordering or through the property; of these, only 29
491 had paved coral or black-top roads. In about half of the
cases where allotments had unpaved roads, these were often
impassable, except by horsecarts. There is a continuing
effort to improve accessibility by expanding the paved
feeder-road system.

241 There were 10 allotments with pigs; in 7 cases, they
231 were either tethered or roaming free. On all but one of

241| these allotments there were permanent dwellings. There were
231| tethered horses on 15 allotments, 7 of which had permanent
dwellings; goats on 3 and cattle on 1, all where permanent
dwellings were present; chickens on 13, in 12 cases near
permanent dwellings; and ducks on 2, both near permanent
[235] dwellings. In only one case were chickens kept in pens
in large numbers. Holders of allotments without permanent
dwellings may keep most animals on their town allotments.

CHAPTER V

PLANT ASSOCIATIONS AND AGRICULTURAL PRACTICES ON TOWN ALLOTMENTS.

125 Data were collected during a survey of 192 town allotments, 113 in Nuku'alofa and 79 in the rural villages of Fo'ui - Ha'avakatolo (20), Niutoua (12), 'Utulau (24) and Fua'amotu (16) (Figure 3).A

351 342 343 Town allotments on Tongatapu average about one-half acre or less and usually contain a sleeping house (*fale mohe*) and, depending on the type and size of household, a number of other structures, including separate kitchens (*peito*), other smaller sleeping houses (*fale mohe*), out-351 houses (*fale vao*), and washhouses. (*Fale kaukau*). Other improvements may include fences, water supply systems, and 351 241 livestock pens. The vegetation complex ranges from almost untended to highly cultivated subsistence and ornamental gardens.

241 128 In the discussion of gardens on bush allotments, the acreage of different crops was considered; however, owing to the limited cultivable area on town allotments, only the presence and relative abundance of crops and important tree species will be discussed. No consideration will be given here to commercial crops and fallow vegetation because they occupy negligible areas on town allotments.

A[See Category 136, p. 14--Analyst.]

312 upon a common public water tap.

369 Table 45. Frequency occurrence of specified water systems on 192 town allotments (113 in Nuku'alofa and 79 in rural villages).

Water System	Nuku'alofa Occurrences	Rural Occurrences
Private tap	41	-
Well	48	2
Rainfall catchment	41	13

231 There was also considerable livestock keeping on town
allotments which, in many cases, tends to affect the types
231 of plants that can be grown there (Table 46). Chickens,
369 goats, cattle, dogs, and cats were found with similar fre-
quencies on town allotments in both Nuku'alofa and the
[235] rural villages. Of the 141 allotments with chickens, 19
allotments had improved chicken breeds for egg production,
[241] 13 of these in Nuku'alofa. Pigs and horses, however, which
cause the most widespread damage to crops, were much more
abundant on rural town allotments. Furthermore, in
Nuku'alofa, on only 7 percent of the allotments were pigs
allowed to roam free, whereas in the rural villages, pigs
were allowed to roam free on 67 percent of the allotments.
[241] Even in Nuku'alofa, where it is illegal for pigs and horses

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369 Table 46. Frequency occurrence of specified animals on 192 town allotments (113 Nuku'alofa and 79 in rural villages).

Type	Nuku'alofa Occurrences	Rural Villages Occurrences
Chickens	80	61
Dogs	69	53
Pigs	51	67
Horses	31	47
Cats	33	24
Ducks	18	2
Goats	10	10
Cattle	9	4

[241] to roam free, considerable crop damage is caused by escaped animals. Ducks were more commonly found in the more low-lying and swampy areas of Nuku'alofa.

Staple Crops

241 The same range of staple crops was found on town allotments as on bush allotments (Table 47). However,
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244 crops such as manioc (Manihot esculenta), yams (Dioscorea alata), and sweet potatoes (Ipomoea batatas), which were common in large acreages on bush allotment, were present

241 244 on 10 percent or less of all the sample town allotments.
On the other hand, staple crops such a swamp taro
241 (*Colocasia esculenta*), American taro (*Xanthosoma spp.*),
244 giant taro (*Alocasia macrorrhiza*), plantains (*Musa paradisiaca*),
245 *pata* bananas (*Musa sp.*), and bananas (*Musa sapientum*),
which require more care and are often planted individually.

241 244 245 369 Table 47. Frequency and percent occurrence of specified staple crops on 192 town allotments (113 in Nuku'alofa and 79 in the rural villages).

Crop	Nuku'alofa Number of Occurrences	%	Rural Allotments Number of Occurrences	%	Total Number of Occurrences	%
Swamp taro	62	55%	4	5%	66	34%
Plantains	43	38%	6	8%	49	26%
American taro	44	39%	2	3%	46	24%
Pata bananas	44	39%	2	3%	46	24%
Bananas	43	38%	2	3%	45	23%
Giant taro	35	31%	7	9%	42	22%
Manioc	18	16%	1	1%	19	10%
Yams	16	14%	3	4%	19	10%
Sweet potato	7	6%	0	0%	7	4%
Goa yam	6	5%	0	0%	6	3%

241 were more common (plantains and bananas are included as
244 staple crops here because they are not cultivated commer-
[245] cially on town allotments). In Nuku'alofa, these crops
were grown on more than one-third of all sample allotments.
Swamp taro was most common, possibly because of the swampy
nature of the low-lying area of Nuku'alofa and the ease
with which it can be planted.

241 The cultivation of all staple crops seems to be much
369 more widespread on Nuku'alofa town allotments than on the
rural town allotments. There seem to be three major
[423] factors influencing this distribution. First, a higher
proportion of people in the Nuku'alofa area have neither
tenure or access to bush allotments (Table 48) and conse-
quently depend upon the market and their town allotments
as primary sources of agricultural products. Secondly,
rural houses are generally closer to their respective bush
allotments, which facilitates their use for crops which are
[685] especially susceptible to theft. Theft seems to be
increasingly bothersome and, consequently, crops which can
be grown safely on the nearby bush allotments of rural
residents are often grown to a greater extent by Nuku'alofa
241 residents on their town allotments. Finally, probably
369 the major deterrent to more extensive cropping on rural
231 town allotments is the presence of free roaming pigs and
other animals. In Nuku'alofa, it is illegal for pigs and
other animals to roam free.

88: Thaman K-5 (1967-1973) 1978 OU9 Tonga OU9
Tongatapu

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Table 48. Nature of tenure and access to bush allotments on Tongatapu of households on 192 town allotments (113 in Nuku'alofa and 79 in rural villages).

Nature of Tenure	Nuku'alofa		Rural	
	No	%	No	%
Households with Bush Allotments	66	58	61	77
Households with Temporary Access to Bush Allotments	7	6	13	16
Households with No Access to Allotments	40	35	5	6
Total Town Allotments	113	100	79	100

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Supplementary Food Crops

The range of supplementary food and beverage crops grown on town allotments included 25 different species (Table 49). Except for chile pepper and pineapple, the most important of these are anciently established plants such as edible hibiscus (Hibiscus manihot), sugar cane (Saccharum officinarum), the edible type of si (Cordyline terminalis), kava (Piper methysticum), lemon grass (Cymbopogon citratus), and species of the genus Passiflora. Other more recent introductions such as green beans (Phaseolus vulgaris), tomatoes (Lycopersicon esculentum), pumpkins (Cucurbita pepo), eggplant (Solanum melongena), and

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Table 49. Frequency occurrence of specified supplementary food crops on 192 town allotments (113 in Nuku'alofa and 79 in the rural villages).

Plant	Nuku'alofa	Rural	Total
Chile pepper	69	28	97
Edible hibiscus	64	15	79
Sugar cane	50	11	61
Si	52	7	59
Kava	43	6	49
Pineapple	22	6	28
Passionfruit(hard)	17	11	28
Passionfruit	19	3	22
Lemon grass	16	4	20
Grenadilla	10	5	15
Green beans	12	1	13
Cherry tomato	10	1	11
Tomato	9	0	9
Pumpkin	9	0	9
Egg plant	2	4	6
Corn	3	1	4
Peas	3	1	4
Ginger	2	0	2
Green onion	1	0	1
Bulb onion	1	0	1
Watermelon	1	0	1

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Table 49. Continued.

Plant	Nuku'alofa	Rural	Total
Peanuts	1	0	1
Cabbage	1	0	1
Carrots	1	0	1
Cucumber	1	0	1

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[369] corn (Zea mays) are cultivated to a lesser extent. Again, cultivation of these plants is much more frequent on town allotments in Nuku'alofa than in the rural areas.

Important Non-Food Crops

There was an even greater range of important non-food plants which were either cultivated or protected on the
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824 sample town allotments (Table 50). The most widespread plants were those useful for handicrafts and the preparation of other material objects (Appendix E), A and included

[TEXT CONTINUED ON PAGE 300]

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Table 50. Frequency occurrence of specified non-food plants on 192 town allotments (113 in Nuku'alofa and 79 in rural villages).

Scientific Name	Nuku'alofa	Rural	Total
Pandanus sp.	51	12	63
Gardenia jasminoides	34	24	58
Pandanus sp.	47	4	51

A [See Category 116, pp. 377-431--Analyst.]

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Table 50. Continued.

Scientific Name	Nuku'alofa	Rural	Total
Gossypium brasiliense	21	8	29
Pandanus sp.	22	2	24
Coix lachryma-jobi	21	2	23
Achyranthes aspera	18	3	21
Gardenia taitensis	15	5	20
Duranta repens	12	3	15
Pandanus sp.	14	0	14
Zingiber zerumbet	13	1	14
Broussonetia papyrifera	13	0	13
Coleus amboinicus	11	2	13
Vigna marina	9	2	11
Cycas circinalis	8	0	8
Curcuma longa	6	0	6
Hedychium coronarium	5	1	6
Jasminum sp.	5	1	6
Wedelia biflora	5	0	5
Piper puberulum	5	0	5
Hedychium sp.	3	1	4
Maranta arundinacea	1	3	4
Artabotrys uncinatus	1	1	2
Derris elliptica	1	1	2
Evodia hortensis	1	0	1
Colubrina asiatica	1	0	1

241 **Table 50. Continued.**
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Scientific Name	Nuku'alofa	Rural	Total
Nicotiana fragrans	1	0	1

241 a number of varieties of *Pandanus* (*tofua*, *tapahina*, *paongo*
824 and *kie*), as well as *Gossypium brasiliense*, *Coix lachryma-jobi*, *Broussontia papyrifera*, and *Maranta arundinacea*.

241 Also of considerable importance were plants used for tradi-
824 tional house and body ornamentation: *Gardenia spp.*,
278 *Coleus amboinicus*, *Hedychium spp.* (*tevunga* and *teuila*),
and *Artabotrys uncinatus*; and for medicinal purposes:
Achyranthes aspera, *Zingiber zerumbet*, *Vigna marina*,
Curcuma longa, *Jasminum spp.*, *Piper puberulum*, and *Wedelia*
[226] *biflora*. The others are all used in some way (Appendix E)A,
such as Derris elliptica, which is used for stupefying
241 fish. Although there is a considerably higher frequency
369 of non-food plants than food plants on rural town allot-
ments, there is still a higher frequency of these plants on
Nuku'alofa town allotments.

Important Tree Species

241 **Fruit Trees**

245 Fruit trees were the dominant vegetation type on most
369 town allotments, both in Nuku'alofa and in the rural

A[See Category 116, pp. 377-431--Analyst.]

241 245 369 villages(Table 51). The similarity in frequencies of fruit trees on the Nuku'alofa and rural allotment may be partly explained by the resistance of trees to livestock damage and the need to safeguard the fruit from occasional theft.

241 245 The most widespread species are primarily native species or pre-European introductions: the breadfruit (Artocarpus altilis), which was present on over three-quarters of all sample allotments, mango (Mangifera indica), the coconut (Cocos nucifera), tava (Pometia pinnata), citrus trees (Citrus spp.), Tahitian chestnut (Inocarpus edulis), Indian almond (Terminalia catappa), and Polynesian vi- apple (Spondias dulcis). Other post - European introductions from America included soursop (Annona muricata), avocado (Persea americana), papaya (Carica papaya), sweetsop (Annona squamosa), and guava (Psidium guajava) (On town allotments the guava generally is found as a cultivated tree rather than a secondary vegetation species.) The remainder of the fruit trees are mostly of more recent introduction, such as the tamarind (Tamarindus indica) and members of the genus Musa which where not considered under staple food crops.

Other Useful Trees.

[369] There is an even greater range of other useful native and introduced tree species (Table 52). As in the case of fruit trees, there was no significant difference in the frequency of occurrence between Nuku'alofa and rural sample

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Table 51. Frequency occurrence of specified fruit trees on 192 town allotments (113 in Nuku'alofa and 79 in rural villages).

Scientific Name	Nuku'alofa	Rural	Total
Artocarpus altilis	91	57	148
Mangifera indica	76	39	115
Cocos nucifera	66	47	113
Pometia pinnata	61	17	78
Citrus limon	46	29	75
Annona muricata	50	21	71
Citrus reticulata	44	22	66
Persea americana	48	16	64
Carica papaya	58	8	66
Psidium guajava	42	14	56
Citrus sinensis	17	22	39
Citrus medica	23	4	27
Annona squamosa	13	8	21
Inocarpus edulis	14	4	18
Musa sp.	9	6	15
Spondias dulcis	7	4	11
Terminalia catappa	7	2	9
Citrus aurantifolia	7	1	8
Tamarindus indica	4	2	6
Syzygium malaccense	2	3	5

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Table 51. Continued.

Scientific Name	Nuku'alofa	Rural	Total
Citrus sp.	3	1	4
Musa lady-finger clone	3	0	3
Syzygium jambos	2	0	2
Annona reticulata	2	0	2
Ficus carica	2	0	2
Morus alba	1	0	1
Malus pumila	1	0	1

town allotments. Most of these trees seem to have been purposefully planted, although some species such as *Hibiscus tiliaceus*, *Aleurites moluccana*, *Pandanus tectorius*, *Casuarina equisetifolia*, and *Bischofia javanica* might have been protected relicts of former natural vegetation. There were many instances of deliberate planting of useful native trees which are becoming increasingly difficult to find growing wild, such as *Decaspermum fruticosum*, *Santalum yasi*, and *Syzygium neurocalyx*. (The major uses of these trees are listed in Appendix E.)[A]

241 In summary, the survey of the Nuku'alofa and rural village town allotments indicates that the town allotments

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[A] [See Category 116, pp. 377-431--Analyst.]

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Table 52. Frequency occurrence of specified useful trees in 192 town allotments (113 in Nuku'alofa and 79 in rural villages).

Scientific Name	Nuku'alofa	Rural	Total
Plumeria spp.	70	44	114
Hibiscus tiliaceus	39	29	68
Aleurites moluccana	34	9	43
Ceiba pentandra	11	29	40
Pandanus tectorius	13	13	26
Glochidion spp.	25	1	26
Casuarina equisetifolia	18	6	24
Bischofia javanica	9	14	23
Cananga odorata	15	7	22
Erythrina variegata	11	11	22
Syzygium aromaticum	17	5	22
Cinnomonum zeylanicum	16	5	21
Phaleria disperma	13	7	20
Aglaia saltatorum	12	5	17
Syzygium corynocarpium	15	1	16
Morinda citrifolia	7	9	16
Alyxia stellata	13	2	15
Fagraea berteriana	12	3	15
Macaranga harveyana	12	1	13
Ficus obliqua	11	1	12

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Table 52. Continued.

Scientific Name	Nuku'alofa	Rural	Total
Jatropha curcas	6	5	11
Tournefortia argentea	4	4	8
Garcinia sessilis	4	3	7
Premna taitensis	4	3	7
Calophyllum inophyllum	7	0	7
Hernandia moerenhoutiana	4	2	6
Excoecaria agallocha	1	5	6
Ochrosia oppositifolia	5	0	5
Adenanthera pavonina	5	0	5
Santalum yasi	3	2	5
Rhizophora spp.	2	2	4
Vitex trifolia	1	3	4
Grevillea robusta	3	0	3
Ellatostachys falcata	3	0	3
Ficus sp.	0	3	3
Gyrocarpus americanus	2	0	2
Decaspermum fruticosum	2	0	2
Diospyros laterifolia	2	0	2
Syzygium neurocalyx	2	0	2
Hernandia ovigera	1	1	2
Garuga floribunda	0	2	2

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Table 52. Continued.

Scientific Name	Nuku'alofa	Rural	Total
Rhus taitensis	1	0	1
Cerbera manghas	1	0	1
Pritchardia pacifica	1	0	1
Albizzia lebbeck	1	0	1
Salix sp.	1	0	1
Xylosma orbiculatum	1	0	1
Pittosporum arborescens	1	0	1

241 are an integral part of the Tongan agricultural system and constitute a valuable source of staple and supplementary food crops and numerous other valuable plant products. 241 369 In the Nuku'alofa area, there seems to be much more intensive cultivation or protection of short - term food crops and other non - food plants. [245] No appreciable difference in the frequency of cultivation or protection of valuable trees species between the Nuku'alofa and rural town allotments was found.

CHAPTER VI

CONCLUSION

128 The purpose of this chapter is two-fold: 1) to
summarize the findings on the nature and importance of the
Tongan agricultural system as practiced in bush and town
allotments in 1971 - 72; 2) to suggest trends or develop-
mental paths that the system is likely to follow.

● 241 Nature and Importance of the Agricultural System

The importance of agriculture in Tonga cannot be over-
241 emphasized. At the 1966 census, 67 percent of the Kingdom's
463 males over 15 years of age were either directly or indirect-
ly employed in agriculture, with 64 percent being directly
involved in agricultural production for household consumpt-
ion (Fiefia, 1968 : 74). Similarly, the results of the
questionnaire survey of households on Tongatapu indicated
that 53 percent of the heads of 150 households were full-
time farmers, 15 percent part-time farmers, 24 percent wage-
earners, and 8 percent unemployed. Of the wage-earners (the
majority of whom live in Nuku'alofa), 58 percent practiced
241 some gardening on their bush allotments. Agricultural
439 products accounted for more than 97 percent of Tonga's
export earnings in 1971 (Government of Tonga, 1972a).

241 One further measure of the importance of the agricul-
438 tural system is the rapid expansion of trading at Talamahu
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Market. Nuku'alofa, which is probably visited by more than 10 percent of the entire population of Tongatapu on an average Saturday. With the exception of garden vegetables grown by large growers on leasehold land and limited produce from other islands, almost all produce and processed goods come either directly or indirectly, as in the case of handicrafts and folk medicines, from the bush and town allotments on Tongatapu.

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Bush Allotments.

Survey results indicated that 34 percent of the area on bush allotments was under cultivation during the 1971 - 72 period. This figure would be somewhat higher if uncultivable rocky and swampy land found on numerous bush allotments is excluded; Hardaker's (1971 : 63) estimate of 36 percent shows close agreement.

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Of the cultivated land, 87 percent was devoted to subsistence cultivation, 11 percent to commercial cropping, and the balance to a combination of the two. [311] On only one of the 101 sample allotments was there any grazing on natural pasture. 241 244 Of the subsistence acreage, the most widespread crop was manioc (Manihot esculenta) comprising 37 percent of the total acreage. It was followed by American taro (Xanthosoma spp.), 23 percent; yams (Dioscorea alata), 21 percent; and then by swamp taro (Colocasia esculenta) and sweet potatoes (Ipomoea batatas). Other

● 241 Other
244 important subsistence crops, sometimes planted alone, al-
245 though generally interplanted with the above crops, were
giant taro (Alocasia macrorrhiza), plantains (Musa paradisiaca), bananas (Musa sapientum), and Goa yam (Dioscorea
[128] esculenta). Excluding coconut palms, which were considered
a tree crop and did not enter into the acreage estimates, bananas (in plantations) comprised 42 percent of the commercial acreage with the balance being made up by other commercial crops such as watermelons, pineapples, peanuts, plantains, corn, and garden vegetables.

Intercropping is most widely practiced with subsistence crops. Yams are almost always intercropped, mainly with giant taro, American taro, swamp taro, and plantains, and occasionally with bananas or Goa yams. Swamp taro and American taro are often intercropped, and manioc and sweet potatoes are rarely intercropped with other species. Only limited intercropping is practiced with commercial crops, although in a few cases taro was planted under bananas, pineapples under manioc, and watermelons among yams.

241 Cropping sequences usually last from two to five
years, after which the land is left fallow from two to six
241 years. After clearing the secondary vegetation and asso-
244 ciated intercropped species, yams are usually the first
crop planted. American taro generally follows yams and in turn is followed by manioc before the land is allowed to

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244 revert to fallow. Sweet potatoes also enter into the sequence, especially in sandy areas. Manioc and taro are commonly replanted on the same plot, in the case of manioc up to four times, before the plot, along with relicts of the
241 taro and/or manioc, reverts to fallow. A great variety of
245 sequences are practiced by farmers, and more recently,
[244] commercial crops such as watermelons and bananas often begin a sequence or are integrated into one. In the case of bananas, the sequence is often broken and with the benefit of fertilization the crop will remain on a given plot for a number of years.

241 In addition to these major staple and commercial crops there is also a great range of other important supplementary food plants, useful non-food plants and trees which are either cultivated or protected in a wild state on bush allotments.

With the exception of Cordyline terminalis, the cherry tomato (Lycopersicon esculentum var. cerasiforme), and the chile pepper (Capsicum frutescens), which are usually protected as volunteers, the most important supplementary food plants are papaya (Carica papaya), edible hibiscus (Hibiscus manihot), sugar cane (Saccharum officinarum), and kava (Piper methysticum), all traditional components of the Tongan agricultural system. Other crops of more recent introduction, include corn (Zea mays), onions (Allium spp.), pumpkins, (Cucurbita pepo), and passion

241 fruit (Passiflora spp.)

[247 248] Of the non-food plants which are cultivated and protected, the most common are a number of species of Pandanus and paper mulberry (Broussonetia papyrifera). There are also numerous other plants which are cultivated or protected because of the value of their fruit, flowers, leaves, roots, bark, and wood for such purposes as the preparation of handicrafts, folk medicines, dyes, scented coconut oil, decorations, and adornment (Appendix E).^A

241 245 Although the major staple and commercial crops tend to dominate the cultivated acreage of bush allotments, the most prominent plants are usually coconut palms and a great range of important tree species. The coconut palm, which was present on over 90 percent of the surveyed bush allotments, is by far the most common and most important cash crop on Tongatapu as well as being of considerable subsistence value. On allotments without palms, insecurity of tenure, unsuitable soil, and the threat of frequent fires were often the reason for their absence. 50 percent of the allotments also had newly planted palms.

Other useful trees, primarily important because of their edible fruit, which seem to be present on over half of Tongatapu bush allotments, include: mango (Mangifera indica), citrus trees (Citrus spp.), tava (Pometia pinnata), breadfruit (Artocarpus altilis), Tahitian chestnut (Inocarpus edulis), and guava (Psidium guajava). Other

A[See Category 116, pp. 377-431—Analyst.]

241 245 common species include avacado (Persea americana), Indian almond (Terminalia catappa), soursop (Annona muricata), Polynesian vi-apple (Spondias dulcis), the Malay apple and rose apple (Syzygium malaccense and S. jambos). More recent introductions such as cocoa (Theobroma cacao), cashew (Anacardium accidentale), fig (Ficus carica), apple (Malus pumila), and peach (Prunus persica) were also found on some allotments.

241 137 Of even greater importance in numbers and frequency of occurrence are at least 67 other tree species, all useful in some way to the Tongan society. They are generally found in a protected state although sometimes deliberately planted. Apart from the value of their timber, these trees are useful in the preparation of medicines, dyes, handicrafts, cordage, scenting for coconut oil, soap substitutes, handicrafts (including carving), canoe construction, and other material goods (Appendix E).[A] The most common trees in this category include Bischofia javanica, Aleurites moluccana, Hibiscus tiliaceus, Morinda citrifolia, Macaranga harveyana, Rhus taitensis, Grewia crenata, Erythrina variegata, Pandanus tectorius, Glochidion spp., Ceiba pentandra, and Santalum yasi. A vast majority of these tree species found on bush allotments are native to Tonga, although some recent introductions such as Ceiba pentandra, Cananga odorata, and Plumeria acuminata are also common.

[A] [See Category 137, pp. 377-431--Analyst.]

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There are also a number of species which have been introduced by the government as part of afforestation schemes; these include: Grevillea robusta, Eucalyptus spp., and Cedrela odorata, which have been planted on some allotments.

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On bush allotments the fallow or secondary vegetation has a very important role in the cropping succession.
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Approximately two-thirds of the area of bush allotments is under some stage of bush fallow or natural vegetation, ranging in composition from native coastal forests, mangrove swamps, tropical lowland forests, and mature stands of secondary forest, to ephemeral associations of pioneer weed species. About 14 per cent of the sample allotments were completely under various stages of fallow vegetation; in no case was an individual allotment under 100 percent cultivation. There were very few areas under what Boserup (1965:15) classifies as forest fallow: under fallow for
[311]
sufficient time for forest to regenerate. Only 9 percent of the uncultivated acreage was over ten years of age, and a majority of this was actually uncultivable coastal or swamp forest. Another 21 per cent had been under fallow for approximately five to ten years and the remaining 70 percent had been under fallow for less than five years and was characterized by bushes, grasses, ephemeral pioneer species, and few trees.

In those areas which had been under fallow for over five years, the dominants are usually native tree species, with some introduced species such as *Lantana camara*, *Psidium guajava*, *Leucaena leucocephala*, *Solanum verbascifolium*, and *Panicum maximum* in more recently cultivated areas. In areas under fallow for less than five years there was a great range of species (almost all exotic), including *Lantana camara*, *Psidium guajava*, *Leucaena leucocephala*, *Solanum verbascifolium*, *Panicum maximum*, *Digitaria pruriens*, and *Jasminun spp.* in the older areas of four to five years fallow; *Melinis minutiflora*, *Passiflora spp.*, *Triumfetta bartramia*, *Ipomoea gracilis*, *Sida rhombifolia*, *Stachytarpheta urticaefolia*, *Indigofera suffruticosa*, *Mimosa pudica*, *Paspalum conjugatum*, and *Sorghum halepense* in areas under fallow for two or three years; and in recently cleared or abandoned areas, more ephemeral species such as *Canna indica*, *Rhynchelytrum repens*, *Synedrella nodiflora*, *Solanum nigrum*, *Bidens pilosa*, *Emilia sonchifolia*, *Vernonia cinerea*, *Erigeron sumatrensis*, *Phaseolus semierectus*, *Sonchus oleraceus*, *Cyperus rotundus*, *Oxalis corniculata*, *Commelina spp.*, *Euphorbia hirta*, and *Portulaca oleracea*. Throughout these recently fallowed areas, volunteers or relicts such as *Manihot esculenta*, *Xanthosoma spp.*, and *Carica papaya* were also common. Of all these species the only ones found in homogeneous stands covering extensive areas are *Leucaena leucocephala*, *Panicum maximum*, and *Sorghum halepense*.

Apart from their value in restoring soil structure and fertility, many of these species are useful as sources

241 137 [242] of food, medicines, firewood, fodder, fish poisons, and other valuable products (Table E).^A Some such as *Cyperus rotundus*, *Commelina* spp., and *Psidium guajava* constitute noxious weeds which have become a current focus of government control programs.

A number of allotments also had uncultivable areas under "natural" vegetation. These allotments were usually found on the coast and included areas of littoral forest on the low-lying leeward northern coast. Although of limited agricultural potential, they are sources of many useful products and constitute gene pools of many species rapidly disappearing from most bush allotments.

241 178 With respect to agricultural practices and improvements on bush allotments, the technology used by Tongan farmers seems to have changed only slightly in the past hundred years. With the exception of the increased cultivation of manioc, American taro, sweet potatoes, and recently introduced banana clones, traditional crops and tree species are still the dominant features of the agricultural landscape. Cultivation techniques have also changed very little from what was described in the mid-seventeenth century (West, 1865:130-139; Maude, 1965:162). 241 [412] Bush fallow is still the primary means of restoring soil structure and fertility; the most widely used tools are machetes and steel bladed hoes and fire for clearing the [242] vegetation. There is some deliberate planting of *Dolichos*

A [See Category 137, pp. 377-431—Analyst.]

241 lablab to improve fallow vegetation as well as an increas-
242 ing use of inorganic fertilizers. In most cases, however,
[654] fertilizers were supplied by the Coconut Replanting Scheme
or the Agricultural Department for use with coconuts,
bananas, watermelons, or export vegetables, rarely for
subsistence crops. The practices of mulching or use of
animal manure were seldom employed.

241 The use of plows and disc harrows for the clearing
407 and preparation of land was common, and approximately one-
half of the allotments have been plowed at one time or
241 another. In most cases, however, plowing was done under
[654] the auspices of the Coconut Replanting Scheme. Commercial
[244] crops such as peanuts and watermelons were often grown on
plowed land, but plowing for staple root crop production
was uncommon.

[244] Most staple crops were well weeded, except for manioc
and taro which seemed to compete successfully with weeds.
241 Commercial crops also seemed reasonably well cared for,
245 except in the case of pineapples which were often overrun
by secondary growth and some banana plantations where
proper desuckering was not practiced and diseased plants
were poorly weeded.

241 Tree crops, however, received very little attention,
245 and coconut palms, both mature and replanted, were often
136 found overrun by secondary vegetation, burned around the
bases during clearing, or left prey to rat, rhinoceros

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[231] beetle, and coconut stick insect predation, with little or no attempt at control. The damage caused by these pests, plus damage to young palms by fire and escaped or grazing livestock, was considerable.

241 Pest control, in general, was rare except for commercial crops. Here the purchase of pesticides, fungicides,
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654 and herbicides was usually borne or at least subsized by the Agricultural Department or the Commodity Boards. In the case of control of black-leaf-streak in bananas, misting oil was actually applied by Department of Agriculture personnel.

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312 Formal irrigation systems were rarely if ever found on bush allotments, and simple wells were found on only about one-tenth of all bush allotments. The use of water for irrigating short term crops such as vegetables and watermelons generally required carrying water in drums from the town allotments or from nearby wells.

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242 The effect of the "Green Revolution" seemed to be almost non-existent. Although the Government Experimental Farm has successfully grown a wide range of new plants such as sorghum, soybeans, rice, and macadamia nuts, very few have been integrated into traditional cropping sequences. In some cases, garden vegetables such as tomatoes, capsicum and bulb onions were planted, but these often required additional non-traditional and expensive inputs such as fertilizers, insecticides, fungicides, and irrigation.

241 417 [245] Fencing, generally to protect crops such as paper mulberry (Broussonetia papyrifera) from destruction by livestock, was found on a number of bush allotments. On 10 percent of the sample allotments good condition barbed wire fencing was used around at least some portions of the land. On others, poor quality fencing or live fences and hedges were found; Erythrina variegata and Jatropha curcas were commonly used.

241 361 [231] Permanent residences were found on 13 percent of the sample bush allotments. These allotments were generally more intensively cultivated and fruit trees, useful plant species, and livestock were comparatively numerous. Temporary thatched houses were found on many bush allotments; these are generally used in guarding valuable crops.

241 231 [262] In some cases, livestock, primarily horses and cows, were tethered or allowed to graze on bush allotments. Most livestock, especially pigs, chickens, ducks, goats, and dogs (which are commonly eaten) were generally kept on town allotments. In almost all cases where these animals were found on bush allotments, the farmer's permanent residence was situated there also.

241 178 [137] In short, the agricultural system, as practiced on bush allotments, seems to have retained much of its traditional character. The types of crops and protected plants, intercropping practices, and plant successions have undergone few major changes. Some changes which have taken

241 178 137 place include:

1) the widespread adoption of the two most common staple crops, manioc and American taro which were of little or no importance a century ago (West, 1865:139; Maude, 1965:162);
2) the integration of commercial crops, such as coconuts in formal plantations, bananas, watermelons, pineapples, and in some cases garden vegetables, into the traditional cropping sequences;
3) the shortening of fallow periods with little or no forest fallow; and
4) the modification of fallow vegetation, which is now characterized by shrubs and grasses and has been enriched by the accidential and deliberate introduction of many weedy species, such as Lantana camara, Psidium guajava, Panicum maximum, Leucaena leucocephala, to mention only a few.

Town Allotments.

241 Agriculture as practiced on town allotments,
although utilizing much the same technology and most of the
same plants, varied considerably from that practiced on
241 bush allotments. The area of about one-quarter acre avail-
351 able for cropping, dwellings, and other structures, limits
the nature of the cropping on town allotments. Neverthe-
241 less, these dooryard gardens did appear to supply a great

241 range of subsistence products.

241 The average town allotment generally has at least one
351 main dwelling or sleeping house (*fale mohe*) plus a number
[342] of other structures, such as separate kitchens (*peito*),
[343] wash houses (*fale kaukau*), outhouses (*fale vao*), and in
[369] some cases pig sties. On a majority of the town allotments
in Nuku'alofa, and to a lesser extent in the rural villages,
fences were found around the entire allotment or around
[417] portions used for keeping livestock. Fences for livestock
[245] were usually of barbed wire. Those which were more orna-
mental or used to delineate property boundaries were often
living fences or hedges, most commonly of *Hibiscus spp.*
241 and *Nothopanax spp.* Wells, rainfall catchment systems, and
312 private water pipes were common on town allotments in
369 Nuku'alofa. In the rural areas, water was generally
obtained from centrally located village water pipes.

241 Within this setting, a great variety of livestock,
231 staple crops, and other valuable plants and trees were
found. Almost all allotments had some livestock; over
half had chickens, dogs, and pigs, while horses, cats, ducks,
241 goats, and cattle were found on several. In Nuku'alofa, the
231 law prohibits pigs and other animals except poultry roaming
369 free. On rural town allotments, however, over half of those
sampled had loose pigs. These constitute a major deterrent
241 to the cultivation of certain crops. Staple crops were
369 cultivated in limited acreages on about half of all town

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369 allotments in the urban area of Nuku'alofa but to a lesser extent in the rural villages. The most common staple crops
241 found included swamp taro (Colocasia esculenta), American
244 taro (Xanthosoma spp.), giant taro (Alocasia macrorrhiza),
[245] and bananas (Musa sapientum), plantains (Musa paradisiaca), and the pata variety banana (Musa sp.), none of which are usually planted as commercial crops on town allotments. Of lesser importance on town allotments were manioc, yams, and sweet potatoes. Swamp taro, which was not as important on bush allotments, was the most frequently planted crop on town allotments, especially in Nuku'alofa.

241 There was also a great range of supplementary food crops and valuable non-food plants that were cultivated and/or protected. The most common of these were chili pepper (Capsicum frutescens), edible hibiscus (Hibiscus manihot), sugar cane (Saccharum officinarum), si (Cordyline terminalis), kava (Piper methysticum), pineapple (Ananas comosus), passionfruit (Passiflora maliformis and P. edulis), lemon grass (Cymbopogon citratus), and grenadilla (Passiflora quadrangularis), introduced vegetables such as tomatoes (Lycopersicon esculentum), pumpkins (Cucurbita pepo), and eggplant (Solanum melongena). Of the 28 different useful non-food plants found on the town allotments, the most common were species of Pandanus, Gardenia jasminoides, Gossypium brasiliense, and Coix lachryma-jobi. Both
[369] supplementary food plants and non-food plants were much

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369 more frequent in Nuku'alofa than on the rural town allotments.

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245 The most impressive vegetational feature on town allotments was the great range of valuable tree species that are cultivated and protected. These included over 75 different species, some of which were found on a majority of all town allotments. The most frequently occurring species were fruit trees such as breadfruit (Artocarpus altilis), mango (Mangifera indica), coconut (Cocos nucifera), tava (Pometia pinnata), and citrus trees (Citrus spp.). Some of the more important non-fruit trees included Plumeria spp., Hibiscus tiliaceus, Aleurites moluccana, Ceiba pentandra, and Pandanus tectorius. [369] There seemed to be no marked difference in the frequency of occurrence of these trees between Nuku'alofa and rural town allotments.

241 Fallow or secondary vegetation was almost nonexistent, except where there were uncut weeds or poorly maintained gardens. [351] Most areas not occupied by structures, cultivated plots, or trees generally consisted of mowed or cut weeds which served as a lawn.

The town allotments, especially in the urban area of Nuku'alofa, seemed to constitute a very important source of food and other subsistence products. 241
369 The range of crops, protected plants, and trees is similar to that found on bush allotments although town allotments have more recent introductions than bush allotments. And finally, livestock

241 369 231 And finally, livestock husbandry was much more widespread on town allotments than on bush allotments.

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Current Trends and Developmental Paths

Based on the nature of the Tongan agricultural system in 1971-72, there seemed to be some definite trends within the system and developmental paths that it might follow, all of which should lead to more intensive use of the land and increased productivity. Some of these trends or possible developmental paths include:

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Decrease in Leasehold Land and Expansion of Bush and Town Allotments

178 423 [427] As leases expire, many are not being renewed and the land is in some cases being subdivided into bush and town allotments. More recently, bush allotments are often four acres in size and town allotments less than one-quarter acre. 241 178 The existence of these smaller allotments should lead to more intensive cultivation, as was the case with most of the sampled undersized allotments.

Increase in Scientific Farming Methods

[654] [242] [312] As a result of government encouragement and subsidies, there seems to be a definite increase in plowing and disc harrowing; the use of pesticides, fungicides, herbicides, and fertilizers; the introduction of new crop varieties; the use of fencing; and dependence on some form of irrigation.

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Increase in Wage Labor

Owing to the increasing need for cash, the growing labor pool, and the number of allotment holders who have wage-paying jobs, there seems to be a definite increase in the number of households employing wage-laborers to work on their allotments.

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Increasing Cultivation on Town Allotments

As the pressure on land becomes more acute, dooryard gardens on town allotments will probably have a greater role in supplying the subsistence needs of the Tongan people. This trend is already evident in Nuku'alofa, where dooryard gardens trend to be much more highly cultivated than those in the less populous rural villages. [241] [369]

Increase in Permanent Dwellings on Bush Allotments

[423] Owing to the limited number of town and bush allotments, the inability of all eligible land holders in a given family to have legal rights to bush allotments, and the improved transportation system, there will probably be an increase in the number of households living permanently on the bush allotments, and a concomitant intensification of agricultural activities on these allotments.

244
178

Increased Cultivation of Non-Traditional Staple Crops

Because of their ease of cultivation and ability to grow on more impoverished soils, there has and will continue to be an increasing dependence on manioc (Manihot esculenta), American taro (Xanthosoma spp.), and sweet

244 potato (Ipomoea batatas). These crops, all of which were
178 infrequently cultivated before the turn of the century,
[438] now have become the most common items sold at Talamahu
Market, and manioc and American taro were the two most widely
cultivated crops in terms of acreage.

241 **Increased Cash Cropping**

178 There will probably be a continued expansion of cash
cropping to supply both overseas markets and the expanding
[242] urban population on Tongatapu. The major focus of government
[654] extension work is the expansion of commercial cultivation
of bananas, coconuts, and a variety of other established
crops such as watermelon, pineapple, garden vegetables,
and root crops; and experimental crops such as
[435] macadamia nuts, onions, strawberries, and garlic. The
rising prices of products at Talamahu market is also a
major incentive for an increase in commercial production
of both traditional and recently introduced crops.

434 **Increased Cultivation of Crops Used for Handicrafts**

439 With the rapid expansion of tourism throughout the
178 Pacific, there is a great demand for the high quality
000 Tongan handicrafts both in Tonga and overseas. Consequently,
there could be a considerable expansion in the cultivation
of plants such as paper mulberry (Broussonetia
papyrifera), pandanus (Pandanus spp.), Job's tears (Coix
lachryma-jobi), and bamboo (Bambusa sp.).

245 Increased Coconut Acreage

654 Owing to the continued efforts of the Coconut Replanting
435 Scheme and the high copra prices in 1974, there should
be a major increase in the acreage of systematically planted
coconut palms in the next five or ten years.

Possible Expansion of Livestock Husbandry

231 Because of government livestock subsidy schemes,
654 there is likely to be an expansion of livestock husbandry
311 and pasture improvement. The expansion of pig and poultry
312 husbandry seem to offer the best prospects because of the
limited land area and water resources on Tongatapu.
000 Accordingly, Hardaker (1971:70) discouraged a widespread
expansion of cattle ownership.

Declining Soil Fertility

134 Owing to the increasing cropping period and associated
241 decrease in the fallow period, the inherent soil
178 nutrient status and structure of Tongatapu soils have deteriorated
considerably. In almost all cases, today's farmers
feel that farmers of previous generations received much
241 higher yields due to more fertile soils. The relative
134 amounts of nutrients stored in fallow vegetation depend on
the extent to which trees and shrubs have been destroyed,
because grasses and herbs store relatively smaller quantities
of nutrients. As a result, there is less addition of
humus and nutrients to the soil both through litter and
root production and through burning. Furthermore, the

241 extension of the cropping cycle reduces the number of
134 stumps, roots, and viable seeds in the ground and slows down the regrowth of valuable plant species and the recycling of nutrients (Nye and Greenland, 1960:32-35). The continued effects of burning also lead to considerable losses of carbonate and phosphate and an almost total loss of useful nitrogen and sulphur (Nye and Greenland, 1960:67).
000 These processes, and a continuing dependence on bush fallow for soil regeneration, will lead to further decline in soil fertility, unless the use of fertilizers and/or other means of soil improvement are sought.

Decrease in Native Tree Species

The combined effects of expansion of plowing, the planting of new coconut palms, the continuing use of fire in clearing, and the need for firewood and timber will probably result in the further elimination of native tree species both from the fallow vegetation and from the few
137 remaining natural forests. Despite occasional protective
313 measures, these tree species continue to be exploited and some are rarely if ever found anymore.

Shift from Traditional to Introduced Vegetation

241 With the gradual elimination of the native primary
178 and secondary forests on Tongatapu and decreasing fallow periods coupled with the government's continued attempts to introduce new plant and tree species, there will probably be an overall shift of emphasis from native and

241 traditional plants and trees to recent introductions. This
178 is already evident in the increasing importance of manioc,
American taro, and sweet potato as well as in the increasing
cultivation of peanuts, watermelons, pineapples, garden
278 vegetables, and improved banana clones. Although still of
824 widespread importance, the use of traditional folk medicine
[178] is gradually giving way to an increasing acceptance of
modern medicine. Consequently, the great range of plants
and trees used for this purpose may become more expendable.
824 A similar trend exists for trees once valuable for scenting
178 coconut oil, cordage, dyes, soap substitutes, and fish
poisons.

241 An even more pronounced trend, is the replacement of
137 native secondary vegetation by exotic species due to the
178 continual reduction in the duration of fallow periods. The
native forests have had insufficient time to re-establish
themselves and the more hardy introduced pioneer species
are now the dominant vegetation on almost all fallow land
241 on Tongatapu. This rapid expansion of weedy vegetation is
a major problem limiting agricultural production. In
addition to their inferior ability to store soil nutrients,
their removal often constitutes a very high labor input,
and in some cases, because of their increasing occurrence
after the extension of cropping periods, cultivators are
[171] often forced to shift to new plots. Watters (1958:344)
found this the case in Samoa, where, after three successive

241 crops of taro, gardens were often abandoned owing to
171 decreasing yields and an increase in weeds or secondary
241 vegetation. Cyperus rotundus, for example, is a partic-
137 ularly serious problem on Tongatapu, where gardens with
vegetables such as tomatoes, lettuce, corn, and cucumbers
are difficult to maintain and are often abandoned due to
241 excessive labour required to control this weed. There are
numerous other noxious weeds which are detrimental to
agricultural production and are the focus of control
programs.

241 In short, these trends seem to indicate that the
178 native vegetation of Tongatapu and the traditional crop
137 associations of the Tongan bush-fallow agricultural system
are undergoing rapid change and in some cases are in danger
[179] of extinction. This seems to be happening with little or
no consideration being given by developmental planners
to the considerable cultural and ecological importance
of these plants.

89: Wood M,Y-4,5 (1924-1937) 1975
OU9 Tonga OU9

Footnotes:

(1) Thomas, John, *History of the Friendly Islands,* p.1, A.1961. MLS. 113
(2) Luke, Sir Harry, *Islands of the South Pacific.*
(3) Buck, Peter, *Vikings of the Sunrise*, p.3.
(4) W. W. Howells, Professor of Anthropology at Harvard University, believes that the first Polynesians came to Tonga through Micronesia about 2000 B.C. Carbon-testing by Jans Poulsen, of Denmark and the Australian National University, Canberra, indicated 500 B.C. as the date for middens he found in Tongatapu in 1965. See also Gifford, E. W., *Tongan Myths and Tales,* Bishop Museum, Honolulu, pp.8 &c., for stories common to Tonga, Indonesia and Micronesia; Gifford, *Tongan Society*, p.350, for comparison of ancient Tongan and Japanese social institutions; Collocott, E. E. V., *An Experiment in Tongan History*, Journal of the Polynesian Society, Vol. XXXIII, No. 3; Hadden, A. B. and Hornell, J., *Canoes of Oceania*, Bishop Museum, pp.339-44, regarding migration of the Polynesians through Indonesia and Micronesia; Sullivan, L. M., *A Contribution to Tongan Somatology*, Bishop Museum, Vol. VIII. No. 4, pp.255-7; Buck, Peter, *Vikings of the Sunrise*; and Heyerdahl, Thor, *Sea Routes to Polynesia*, for another theory of migration. [172] [174]
(5) Gifford, ibid; Collocott, ibid; *"Folk Lore,"*, Translations of the Folk-Lore Society, Vol. 35, No. 3, 30 September 1924, pp.279 &c.
(6) Although a tradition states that the stones were brought in a great canoe, Lomipeau, from Uvea, which is actually a volcanic island, the stones were probably obtained from the coral reefs of Tongatapu itself. The transport of the huge stones on rollers and the erection of these monuments, using only stone axes, must have been very laborious. McKern, W. C., *Archaeology of Tonga*, Bishop Museum, gives details of the tombs and the trilithon; and Collocott also. The present king, Taufa'ahau Tupou IV, has shown that the markings on the cross-piece of the trilithon point in the direction of the sun at the summer and winter solstices and evidently denoted the times for yam-planting and for giving first-fruits as a sacred duty to the Tu'i Tonga. [173] [349] [821] [[illegible]] [651]
(7) For further particulars on Tongan society, see Gifford, Collocott, and Latukefu, S., *Church and State in Tonga.*
(8) An example of this is the survival of a shipwrecked Tongan crew for 103 days in 1962 on Minerva Reef. Ruhen, Olaf, *Minerva Reef.*
(9) Thomas, J., *History of the Friendly Islands*, p.33, A.1961. M.L.S.
(10) For further particulars of Tongan religion, see Hastings' *Dictionary of Religion and Ethics*, Vol. 12, art. "Tongans". Dr. J. E. Moulton; Mariner, W., *An Account of the Natives of the Tonga Islands,* &c., Vol. 2, pp.132 &c.; Gifford, *Tongan Society*, pp.287-347; Thomas, J., *History of the Friendly Islands*. A.1961, M.L.S.; West, T., *Ten Years in South-Central Polynesia*, pp.255 &c.; Farmer, S., *Tonga and the Friendly Islands*, pp.125 &c.
(11) Cook, J., *Voyages of Discovery*, Everyman Edition, p.290.
(12) Zimmermann, H., *Account of Third Voyage of Captain Cook*, p.17.
(13) Cook, ibid, pp.287-8.
(14) Cook, ibid, p.265.
(15) Rabone, S., *Journal*, 27 July 1841. Set 47. M.O.M.C.
(16) Langdon, Robert, *Journal of Pacific History*, Vol. 1, 1966, p.186.
(17) Edwards & Hamilton, *Voyage of H.M.S. Pandora, 1790-1*, p.135.
(18) Edwards & Hamilton, ibid, p.134.
(19) Edwards & Hamilton, ibid, p.132.

121 a simple, stable base advancing through strata which
becomes progressively more complex.

For Tonga, and indeed for other Pacific
457 Islands, tourism should develop in conjunction with—
179 and perhaps only after—several basic components of
the economy have been stabilized. After this, an organized tourist-oriented infrastructure must be developed including trained individuals and increased and improved transport. Tongans have gradually developed both facets of the economy, although more may be necessary.10 ^A

Too many tourists in Tonga could "drain" the carrying capacity of the land (as well as the patience of the Tongans). Basic food-producing industries of the
Kingdom must be further improved. For example, in
[439] 1974 Tongans imported 560 tons of frozen fish, while
[228] the Tongan Government fishing vessel caught only 66
tons, roughly a ration of eight to one. In an attempt to
457 solve this, the Tongan government is encouraging loans
179 to improve the fishing industry. In addition, a three-
228 year program funded by the United Nations Develop-
648 ment Programme (UNDP) is aimed at developing the
local fishing industry. The UNDP will provide Tongans with some $230,000 as well as technical and managerial assistants to work with the fishermen.

457 The UNDP (along with the International
648 Labor Organization) has also provided Tonga with basic
aid toward improving the tourist infrastructure: a three-month course in tourism began late in 1974 and ended in January of 1975. Over one hundred Tongans took part in the training session. Another upgrading course started in February, 1976.

Development of tourism design must go
167 hand in hand with other aspects of Tongan life: more
464 must be done to encourage the emigrating Tongans to
[457] stay in the Kingdom. Population pressure, high unem-
[179] ployment, the increasing influence of Western values,
and the availability of relatively well-paid work in New Zealand compel many young Tongans to leave Tonga.
167 This movement of Tongans overseas markedly affects
464 the Tongan economy, as recent trends make clear: pri-
179 vate and government building in Tonga has fallen behind
as a result of lack of skilled workers, and equipment is lying unused. One government building project lost two-thirds of its staff. What is true for the construction trade
167 is also true for the private farmer:

> 464 If the drain of laborers to New Zea-
> 179 land goes unchecked, a crisis could de-
> 241 velop in Tonga's agriculture. This
> warning is sounded by the Director of Agriculture, Mr. Tomasi Simiki, who said this week the migration of workers to New Zealand—even temporarily—was already being felt in farming. Farmers are producing less because they

[p. 91-A]

A. [For footnote see p. 93-A--Analyst]

167 simply cannot find the same number
464 of workers. "Price-hiking is becoming
179 unavoidable as food items become
241 scarce," Mr. Simiki said.[11] A

[435] In 1972 the Tongan Assistant Secretary in
the Ministry of Finance pointed out that "every year
871 only about 5 percent of the school-leavers find wage
464 employment in the industrial and tertiary sectors" of the
[645] Tongan economy.[12] B

457 As a result of this untenable situation, the
New Zealand overseas work scheme was begun in 1971.
434 This system contributed significantly to Tonga's favorable balance of payments in 1972-1973. In 1971-
464 1972, net remittances by Tongans working overseas totaled some $1,250,000; and for 1972-1973, this had increased to approximately $2,000,000. This money, along with donations, gifts, and contributions from overseas ($2,150,000), helped to offset the Tongan trade deficit.[13] C (In 1972-1973 gross tourism earnings provided Tongans with some $1,530,000. Compared with the previous year, tourism revenues increased by some 24 percent.)

Though the work scheme improves the bal-
[439] ance of payments in Tonga, most of the money earned by Tongans in New Zealand is eventually returned to New Zealand to pay for increased imports. Also, the
[593] overseas work scheme appears to be contributing to
[586] family tensions and an increased divorce rate in Tonga.[14] D
Crocombe has criticized the overseas work scheme as
[648] a form of "poorer independent islands subsidizing their rich big neighbors," even though the Tongan government requested the New Zealand government to initiate such a work program.[15] E While there may be some short-term benefits to Tongans, long-range analysis of this work scheme may prove Crocombe correct.

The Tongan government and private entre-
179 preneurs must encourage the diversification of the
464 Tongan economy beyond short-term overseas work
457 schemes. Tongans, for their part, must realize that tourism is not the ultimate solution to economic stability. A 1969 United Nations consultant's report stated:

> There is no immediate prospect of absorbing in gainful employment more than a very small proportion of those who cannot find work on the land. The visitor industry (tourism) is unlikely to be a really significant employer of labor . . . .[16] F

Besides being small-scale, tourism is un-
457 reliable as a steady source of income for Tongans. In
434 1972, for example, at least forty tour groups cancelled their visits to Tonga because of the uncertainty of air travel to and from the Kingdom. Late in 1973 and early in 1974, five cruise ships cancelled their stops at Tonga

[p. 91-B]

A, B, C, D, E, F. [For footnotes, see pp. 93-A &93-B--Analyst]

94: Decktor Korn E-5 (1969-1970) 1976
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Tongatapu
Motulahi

cultural context of population characteristics. The difference is that in 121
one case the demographer is invited onto anthropological territory, and
in the other case the anthropologist speaks the demographer's language.

Enumerating the Population of Motulahi

Rather than continuing to discuss household surveys in the abstract,
I shall use my own data from the Kingdom of Tonga as an example.
These materials were collected in the course of an anthropological in- 101
vestigation of local organization in Tonga (conducted over a ten-month
period in 1969—70).

The Tonga Islands lie just west of the International Dateline in the
South Pacific Ocean, east of Fiji and south of Samoa. There are about
150 named islands, but most of them are little more than elevated reefs
and have no potential for cultivation or settlement. Thirty-six islands
were inhabited at the time of the last reported census, held in 1966
(Fiefia 1968, Rogers 1969). These inhabited islands comprise 238.81
square miles, almost 90 % of the land area of Tonga. At the census of [161]
1966 the population was 77,429, of whom 98.31 % were classified as [162]
Tongan (in contrast to others such as Europeans, part-Europeans, and
other Pacific Islanders). The majority of the population lives in villages [361]
that are dotted throughout the islands in a nuclear pattern of village
settlements. Most of the people who live in the rural areas and many of [241]
those who live in the towns are wholly or partially dependent for their [433]
livelihoods on peasant agriculture.

My research was based in the village of Motulahi, one of the largest 114
villages on Tongatapu, the main island of Tonga. It might be asked
whether Motulahi is a typical village. However, the nation of a typical 184
village has no application to Tonga, for there is considerable diversity
among Tongan villages with respect to a number of important variables.
For example, there are significant differences between isolated village-islands on the one hand and villages on the relatively large island of
Tongatapu on the other, or between a village on Tongatapu less than
a mile from the capital town and another at the far end of Tongatapu.
Villages in Tonga also differ considerably with respect to size of population, from less than one hundred people to more than one thousand,
and the dimension of size cuts across the dimension of location. There

occasion of the presentation of shields 575
for the best village and district. Local 462
shows are also held. 543

This sense of responsibility for village 575
improvement links the function of the 462
Langa Fonua with that of the Women's 624
Health Committees in the villages, vol- 744
untary bodies whose object is to improve the standard type of Tongan dwelling house by building sanitary bath houses, cooking and eating shelters and if possible tanks for water storage. Inspec- [241]
tions are carried out regularly to enforce rules of cleanliness and to encourage vegetable and flower gardens.

Members of the Health Committee [757]
help with treatment of mothers and children for minor or skin ailments and give advice on infant and child care, including feeding. The Health Com- [164]
mittee works in close touch with the visiting Child Welfare Nurse; scabies has been reduced almost to vanishing point.

Extensive Child Welfare Services

Child welfare has an important place 744
in the Government programme. A 743
beautifully equipped and expensive new 855
mobile Child Care Clinic with its enthusiastic staff of one New Zealand Plunket-trained general and maternity nurse with one or two Tongan student nurses visits every village in Tongatapu every fortnight for preventive care including weighing, dieting and treatment of minor ailments as well as antenatal cases. All pre-school children are thus under regular observation.

The driver is an integral part of the team, taking his share in dealing out both liquid foods and advice or acting as interpreter.

[P. 28-C]

/11 cont./

101 volcanic eruption) and Niua Toputapu (with Tafahi). 'Ata, the
[504] southernmost island of the Archipelago, was evacuated shortly after
[731] 1861. (4)

4. Following the visit of a Peruvian slave ship.

132 The climate of the Tonga Archipelago, especially as regards the main group of Tongatapu, may be called more subtropical than tropical. (The difference with Samoa, for example, is considerable.) For the tropics it is an agreeable climate. Naturally, there is a difference between the northern and the southern islands of the extended Archipelago. Generally speaking, the maximum temperature lies between approximately 27 to 32 degreees Celsius; the mean temperature amounts to approximately 21 to 27 degrees Celsius. There is no sharp, regular seasonal change, so that one can scarcely speak of a "rainy season" and a "dry season." Rain may fall in every month. The division summer/winter is, however, justified, for heavier rains /12/ occur more often in the months from December to April (summer), along with higher temperatures and shifting, often easterly winds. In these months hurricanes may also occur. Lower temperatures (often with rather cool nights, especially on Tongatapu), along with usually lighter rainfall, or absence of rainfall for months and prevailing east-southeast (southeast) trade winds, are observed most years from May to November. Sometimes persistent droughts occur in the months of October to December.

133 Earthquakes are quite frequent, but generally so slight that they do not cause particular damage.

134 The Tonga Islands are relatively fertile (aside from soil
depletion occurring on several densely populated islands). Vegetation
137 is in general luxuriant. The inhabited and several of the uninhabited
● 241 islands are almost completely covered with more or less well-tended
plantings of the natives, save for the strips of bush around the edge

137 /12 cont./
241 of the island, left standing as a protection for the plantings.

174 Polynesians, probably coming from Samoa, reached this
Archipelago 1000 to 1500 years ago, and settled many of its islands.
All the Tonga Islands, from Niua Fo'ou and Niua Toputapu in the north
to 'Ata in the south, formed a kingdom headed by Tu'i Tonga. The
[173] latter lost power after approximately 1470, when it passed over in
part to collateral lines (Tu'i Ha'atakalaua and Tu'i Kanokupolu) of the
175 ruling family. A revolt in the year 1799 introduced a period of
177 civil-warlike confusion that did not end until 1852. At this time
[669] European influences (5) has long since reached Tonga. For in the year 1616 Niua Toputapu and
Niua Fo'ou were discovered by Shouten and Le Maire, in 1643 Abel
Janszon Tasman found 'Ata, 'Eua, Tongatapu, Nomuka, Tofua and Kao, and
from the year 1767 (Wallis) the Tonga Islands were increasingly
visited by European ships. In 1795 the first whites settled in the
[797] Archipelago, and the systematic missionary work in the island group
began in the year 1826. At the end of the civil wars and after the
175 643 first quarter century of successful mission work, Chief Taufa'ahau of
Ha'apai, who possessed certain rights to the ruling title of Tu'i
Kanokupolu, headed the united Christian state of all Tonga Islands, as
King George Tupou I. (6)

[113] 642 161 648 /13/ Today the Tonga Kingdom with a population of nearly 50,000 natives

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5. By "European" influences we mean, above all, West European influences, especially English and, related to these, Australian, New Zealand and North American influences.

6. A more detailed description of the development from 1616 to 1852 in G. Koch, Die Fruhen europaischen Einflusse auf die Kultur der Bewohner der Tonga-Inseln /The early European influences on the culture of the inhabitants of the Tonga Islands/. Manuscript dissertation, Gottingen 1949.

/23 cont./

181 near a group eating together. Children play catch with captured [825] wild birds until the latter perish, while adults raise no objection.

181 178 The Tongan character which, along with a large measure of kindness, was at one time also characterized by a certain brutality toward human beings, (27) seems to have changed (28) to the extent that today brutal behavior toward fellow-humans is regarded as revolting and almost never occurs.

*181 These natives definitely give the impression of a peaceable, rural people attached to their soil. The daring that characterized their forefathers who, as intrepid seafarers, crossed the ocean, seems to be lost. Yet this impression is misleading. Those Tongans who
[484] nowadays cross the vast ocean every day in their small, primitive and
[502] overloaded cutters, the men who in a storm in January 1952 salvaged
[226] an unmanned cutter driven on a reef outside Nomuka by swimming out
[648] into the surging sea, the young natives who, with their catapults,
[701] shoot fish swimming below the surface in the shark-infested sea, as well as the large number of those who volunteered for action in the last war (and the attitude of the 50 Tongan fighters on the Solomons) prove that the Tongan, even under altered living conditions, has preserved his ancient valor. The old Polynesian urge to seek and colonize new land has, however, disappeared. Stubbornly the Tongan
[823] inhabitants remain on their presently occupied and, in part, over-
[241] populated islands; at best they /24/ will lay out a few plantings on neighboring islands and disregard the fertile and as yet unoccupied islands of the Archipelago. (29)

27. For example, Martin, *loc, cit*. I, pp. 84/85, 210; Wood, *loc. cit*. pp. 28, 32, 38, 48.

[797] 28. Doubtless especially because of the strong missionary influence and the corresponding government authority inspired by it.

/25 cont./

181 461 supplied, a large copra shed on Nomuka; in the morning at eleven o'clock they began digging the holes for the concrete piles and at 6:45 the following day the shed was finished (25 concrete piles, a wooden floor, beams, plank walls, corrugated iron roof). The incentive for this work was the wish to sell copra on their own island and to spare themselves the long sea journey to Pangai or Nuku'alofa.

Therein also lies the qualification for the label "industrious" as applied to the Tongan: it must always be in his own interest that he devotes himself to his work (this interest can easily include love or respect for another person). For example, he will cultivate [241] [554] a field properly, often putting a great deal of loving work into it in order to have a good yield which will feed himself and his family and will also help him gain recognition and respect in his village community--for example, through the size of his tubers. (34)

34. Thus it may also happen that a Tongan expends a great deal of energy to lay out a decidedly neat and exact model planting (on Lifuka, for example, a few Tongans left their village of Pangai and live on their plantation in order to give it the greatest possible amount of time and work) because he can be proud of it and sets himself apart from his fellow villagers.

However, there is scarcely a Tongan who will work "for the sake of the work itself" (that is, driven to work by a non-practical impulse or a restless desire): nothing seems so alien and grim to his as the idea of "duty." In the government offices the white co-workers of the Tongan ministries complain that many tasks which a native employee started with great interest and energy is simply abandoned as /26/ soon as the initial fascination of the new task has worn off; many Europeans there will compare this Tongan way of working with the way a child plays. (35)

/102 cont./

000 of power of the nobles--though they have not disappeared.

621 178 Seen as a whole, the old, strong feeling of solidarity in the Tongan community has been preserved. Even today we see, especially in the villages of the small islands, the old mutuality which is neither communist nor is it made up of families isolated from each other. (574) (425) (476) Every Tongan can still join any group in the village having a meal and can eat with them, and in most of the settlements every inhabitant may ask any other for objects or for personal help, and no one will generally refuse to fulfill his wish. (177) European influences (such as money, the idea of property, different denominations) have up to now--except in special cases--not led to the individualization of families, which to us in Europe is so much taken for granted.

/103/ b) Social Stratification

565 The principal social classes in ancient Tonga were: the chiefs ('eiki), their personal attendants, counselors and helpers (matapule) and the commoners (tu'a).

(241) (427) The commoners, that is, the mass of the people, were in most cases farmers who cultivated the chief's lands which they lent out to them. Every tu'a along with his family was completely dependent on his chief. The 'eiki (whose title was hereditary) had absolute power, often arbitrarily exercized over the life and property of the commoners. (286)

286. See J. Cook, Beschreibung...VI. pp. 294/295; W. Ellis, An authentic narrative... /cited in English/ p. 115; J. Martin, loc. cit. I. pp. 59/60; II. pp. 92, 300; E.W. Gifford, Tongan Society, p. 110.

565 554 The matapule served the chiefs as a sort of minister. As a rule, the title of the matapule was handed down in the same family; a matapule served the chief with whose ancestor his own ancestor had lived. The rank of the matapule depended specifically on that of his

/119 cont./

423 amounts to more than 200 individuals per square mile. The greatest
[161] density is in the Ha'apai Islands. There, for example, if there
[428] are three sons in a family, one of them (generally the oldest)
usually inherits, after the death of his parents, the api'uta of his
father (in addition to his api kolo) and the other two will often no
longer be able to receive an api'uta of their own if they apply for
[161] it. The Tongan population has grown very much in comparison with the
past, and there is sufficient land available only on the large
inhabited islands or on some uninhabited ones. (329)

[425] 329. In 1950, according to government documents,
[427] of the 188,975 acres available for
distribution, only 78,345 had been given
out (as api'uta to 8647 taxpayers and as
[113] lease lands to foreigners and Tongans).
The remaining 110,630 acres were still
available (minus the village and urban
areas) (see Report of the Minister of Lands for the Year 1950 /cited in English/. Nuku'alofa 1951. p. 1).

These two sons can get their own api'uta of $8^{1}/4$ acres on Tongatapu or 'Eua, for example. But usually people prefer to remain on their home island. (330)

[162] 330. On the island of Nomuka, for example, among
[425] a total population of 567 souls, there are
69 men who have a right to an api'uta, but are
unable to get it because all the land has been
distributed; they are staying on Nomuka even
though they would be able to receive their
api'uta on Tongatapu, for example. While all
land claims must still be provided for within
the Archipelago, 4307 taxpayers in 1950 did
not take over an api'uta for the aforementioned
reasons (see Report of the Minister of Lands for the Year 1950. p. 2).

People are attached to their islands and their kinsmen, and they may
[425] also dislike to clear virgin land. Thus they stay in their villages,
[241]

/119 cont./

423 live with their kinfolk and help them cultivate their land, or they
425 may take over a small piece of their api'uta (or land from another
● 241 villager) for temporary, independent /120/ cultivation, with the
secret hope of some day obtaining a plantation on their own island
(for example, if a person with no one to inherit his land should die).
463 Some of these "landless" individuals also specialize as fishermen, for
464 example, or they hire themselves out as workers in public service, or
they look for work as sailors on the many native cutters. In the
towns of Nuku'alofa, Neiafu amd Pangai/Lifuka a few Tongans pursue
definite professions in the government and in business, which leaves
them little time for cultivating the land, so that some of them do
not care to have land for planting allocated to them.

592 The unevenness of land distribution may be shown in the following
423 examples:

Of the 91 households owning land on 'Uiha/'Uiha (Ha'apai-Group)

3 households each with circa 2 acres (331)

331. The data in acres are estimates of well-informed Tonga.

1 household with circa					2½	acres
4 households each with circa					3	"
2	"	"	"	"	3½	"
10	"	"	"	"	4	"
1 household		"	"	"	4½	"
5 household		"	"	"	5	"
4	"	"	"	"	5½	"
19	"	"	"	"	6	"
2	"	"	"	"	6½	"
5	"	"	"	"	7	"
6	"	"	"	"	7½	"
12	"	"	"	"	8	"

/120 cont./

592 423 1 household each with circa 9 acres (332)

[425] [431] 332. A few households have more than 8 acres at their disposal because two (or more) legitimate claimants have received their own api'uta (for example, father and son over 16), others because they have been given the land as gifts, or an api'uta was additionally taken on by another person (see above).

3 households each with circa 10 acres
2 " " " " 11 "
4 " " " " 12 "
1 household " " 13 "
3 households " " " 15 "
2 " " " " 16 "
1 household " " 21 "

Thus, on an average, one land-owning household in 'Uiha controls [621] slightly more than seven acres. Since the village consists of a total of 100 households (333)

[241] [431] [602] 333. Some landless individuals plant on the land of fellow-villagers, or else land-owners give products to their relatives who have no land.

there are just under 6½ acres alloted to each household. The land distribution in 'Uiha is apparently sufficient for the needs of the inhabitants, since each household has at its disposal enough food from the plantations of the village, and there is no dissatisfaction to be noted over the varying sizes of the individual api'uta.

Of the 32 land-owning households in Fungamisi/Vava'u 1 household has (circa) 3 acres (334)

334. The data in acres are estimates of well--informed Tongan.

1 household has (circa) 5 acres

/120 cont./

592 1 household has (circa) 6 acres

423 3 households have (circa) 7 acres each

8 " " " 8 " "

1 household has " 9 " (335)

[425] [431] 335. A few households have more than 8 acres at their disposal because two (or more) legitimate claimants have received their own api'uta (for example, father and son over 16), others because they have been given land as gifts, or an api'uta was additionally taken on by another person (see above).

/121/ 2 households have (circa) 10 acres each

1 household was " 11 "

2 households " " 12 " "

1 household has " 14 "

1 " " " 19 "

1 " " " 25 "

Thus, on an average, a land-owning household in Fungamisi has approximately 9 and 2/3 acres at its disposal. Since the village consists of a total of 45 households, (336) [621]

[241] [431] [602] 336. Some landless individuals plant on the land of fellow-villagers, or else landowners give their products to relatives who have no land.

each household is alloted an average of slightly less than five acres. Here too the distribution of land seems to suffice for the needs of the inhabitants.

423 657 This inequality of land distribution will become greater in the future as conditions become more complicated from generation to generation (inheritance of individual api as well as removals), especially since drastic measures on the part of the government in the form of redistribution are improbable because of the difficulties involved.

/121 cont./

000 involved. Moreover, the Tongan population is growing very much; the
423 dearth of land in the Ha'apai Islands will increase, on the other
[161] inhabited islands land will become scarce after one or two generations.
[311] However, the opening-up of the Archipelago's uninhabited islands, as
well as a few land reclamation projects along the broken-up coasts
(or in the swamps) of the low islands (for example, Tongatapu), and
above all an intensification of agriculture will always be able to
provide relief.

423 Without doubt there is the possibility that a greater difference
184 between rich and poor will develop as a result of the unequal land
578 distribution, and on the small, already overcrowded Ha'apai Islands
social tensions might possibly arise. Today, however, nothing of
this kind can be observed; the Tongans live their relatively peaceful
lives and no one gets excited if he sees his neighbor ending up with
greater profits from his copra work because of his large plantation.

423 European advisers and critics admit that the present system
178 of land ownership is basically good, given the present state of
agriculture. Yet they emphasize that this system is not flexible
enough to make room for possible changes (improvements) in cultivation
and in increased cattle-raising, which is scarcely possible with
8 ¼ acres. Since, for the natives, the present system of planting
[241] suffices and they find it most difficult to adopt new food plants,
[233] and since they show relatively little understanding for cattle-raising
even where there is an opportunity, a change in the system does not,
for these reasons, seem very urgent.

423 /122/ On the whole, it may be said of land distribution that the
177 ancient Tongan system was altered as a result of Europeanization and
the establishment of a Christian, democratic government. However,
423 this change occurred more in form than in kind. The present system
565 of land distribution, which seems somewhat strange to us, means a

/149 cont./

177 ones of their own, or are simply regarded as "representative." This
178 change has, however, not essentially altered the ancient Tongan style of household living. The great majority of natives use the seat mats and the sleep mats, as did their forefathers, and have merely made their traditional way of life more comfortable with the European
178 novelties. The difference between the furnishings of commoners and
565 nobles, which to some extent undoubtedly existed in earlier times, has disappeared. With respect to Tongan cultural assets this must have meant a loss in quantity and quality for nobles and a gain for
177 commoners. The acquisition of European things is today solely dependent on financial means.

342 /150/ To sum up, we may say about the Tongan house and its
177 furnishings that all changes, as great as they may be in detail,
178 have by no means changed the function of the dwelling. As in old times, it is the place where the family sleeps and rests. (396)

396. The set-up of the Tongan household and the distribution of houses on the individual properties in the village may be seen on page 90 ff., and the number of houses in the various villages on page 134.

[461] No work is done in the dwelling except the mat-plaiting of the women,
[285] and the cook area is still located in a separate hut.
[252]

B. FOOD

a) Cultivation

241 The Tongans were and are primarily farmers, and their cultivation
178 has undergone no fundamental change through European influences.
(177)

Very probably the size of the land cultivated today in the Tonga Archipelago is as large as it was in ancient Tongan times. The
[161] considerable decrease of cultivation in the first half of the past century (as a result of the civil wars from 1797 to 1852 and the transition to village settlements) has as regards to the area of

241 /150 cont./

178 cultivation probably been made up for since the population has
(161) doubled in comparison with ancient Tongan times, and since it nourishes itself primarily on home grown products, the necessity for cultivation should be considerable. Thus today, for example, the in-
241
311 habited islands of the Ha'apai group are almost entirely covered with plantations of the natives, except for the strip of bush land along the shore (to protect the plantations against storms) covering approximately ten percent of the land. On the island of Nomuka, for example, according to the recollection of older natives, there was a great deal of unused bush land in the old times, whereas today all productive land is cultivated, however, on Tongatapu, 'Eua and Vava'u part of the land is still unused.

241 Considerably more work seems to be required of each individual to cultivate his land than even just a few decades ago. The views of informants on various islands of the Archipelago indicate that 30 or 40 years ago it was much easier than it is today for the Tongan to feed his family with what he planted, and several relatives besides.
(134) The reason for this change probably lies particularly in the exhaustion of the soil on the naturally quite fertile islands, where, in various places for instance, there is no longer enough land available to /151/ introduce the necessary periods of fallow, (397)

397. Fertilization is still unknown.

and there is therefore relatively little yield, particularly from the yam plants. The increased population can, however, still live well on the products of its planting, (398)

(731) 398. Except for occasional hardship as a result of drought or storms.

even though there is no longer the surplus of products that G. B. Forster, for example, reports (on Nomuka) (399)

/151 cont./

241 399. G. Forster, loc. cit. V. p. 150.

241 The Tongan today works the land granted him by the government
423 (api'uta). (400)

400. See p. 172 ff.

The api'uta are scattered over the islands (or rather, the districts)
with no special system, so that for example, a villager will have his
land in the northern part of the island (or district) and his
neighbor will have his in the south. For various reasons, not all
[602] Tongans have received the 8¼ acres of plantation land to which they
[427] are legally entitled; (401)

401. See p. 173 ff.

the size of the individual plantations varies, and some natives work
along with relatives or cultivate land of fellow-villagers to whom
they then give part of their harvest (for example, one-fourth) in
241 acknowledgment. Whereas in ancient Tongan times the chiefs exerted
656 authority, force and supervision over commoners who cultivated the
178 land that was granted them--especially for the benefit of their
[423] lords--, nowadays the Tongan government is the supervisory authority.
[565] By law, every owner of an api'uta must plant one-half of his land with
coconut palms and raise food plants onthe other half (among them
plants of economic value), the kind and amount of which are specifically
[622] determined. The "town officers" /cited in English/ see that these
stipulations are carried out--in accordance with the regulations of
[634] the "district officers" /cited in English/. (402)

402. Regulation No. 11 of 1948 demands, for
example, that the owners of individual
api'uta grow the following:

/151 cont./

241
656
178
433

Plant	Amount	Day on which planting must be finished
Yams................	600	December 31, 1948
Taro................	150	"
Manioc..............	200	"
kape................	50	"
Bananas (siaine)....	100	"
Sweet potatoes......	300	June 30, 1949
Maize...............	100	"
Reed (kaho)..........	10	"
Kava................	10	"
Sugarcane (au)......	50	"
Paper mulberry trees	100	"

(The governors have the power to order changes depending on local conditions.)

[425] The government has the right /152/ to take away the land from the
[686] lessees who do not comply with the regulations. However, it scarcely
makes use of this right. There are some plantations that are seldom
visited by their owners and are rather overgrown, and no one seems
241 to care about punishment. The majority of Tongan, however, plant
656 approximately the prescribed amounts and often go beyond the measure
stipulated of basic food plants for which the numbers are set relatively low; other plants, such as maize and the reed used for house
construction, as well as sugarcane are preferably "forgotten."

241 Planting--as in old times--is purely men's work; very seldom,
[462] and then mostly for certain auxiliary work (for example, "sweeping"
a freshly burned-off plantation) do women come "into the bush." The
241 average Tongan goes to his plantation several times a week (up to six
461 times), early in the morning around six o'clock, and works at weeding,
512 planting or harvesting until ten or eleven o'clock, and then goes
back to the village. Often he visits his plantation again in the
afternoon from 15 (16) o'clock until 18 (18:30) o'clock. The natives

/152 cont./

241 are capable of working intensively four to five hours at a stretch,
461 but do not always do this consistently. While the majority visit
[512] their plantations several days a week and the rest of the time devote
[517] themselves to other occupations (for example, fishing, copra-production), there are in every village some natives who visit their small, half wild plantation at most once a week and spend the remaining days chatting in various houses of the village. Still another "minority," on the other hand, have the ambition to lay out truly "model plantations"; they devote almost all available time to their very neat and precisely laid out plantation, spend the night there in a specially erected hut for days, weeks or months, or move there
[476) altogether with their families. The Tongans work on their plantations by themselves or, especially in case of larger projects, (403)

403. For example, clearing to lay out a yam field.

in groups (a one-time arrangement or a regular kautaha. (404)

404. See p. 137.

241 Although nowadays the Tongans, in their opinion, give a consid-
461 erable amount of work and time to their plantations, most of these
178 appear less cared for than in old times. The "neat fences of reed"
[417) (405)

405. J. Cook, Beschreibung.../Description/ loc. cit. VI. pp. 163, 178, 222.

which in former times enclosed the plantations have long since disappeared and have been partly replaced by single, rusty barbed wires.
241 Within the plantations themselves one often misses the ancient Tongan
178 love of order; some of the /153/ plots, with the exception of a few
461 "model plantations," seem disorderly, and tall weeds proliferate. The reason for this is, of course, that today the Tongan generally does not live on his plantation and, because of the sometimes rather long

/153 cont./

241 way he has to walk from the village, he can no longer devote himself
178 to it as intensely as in the 18th century; secondly, many natives
461 seem to have lost their joy in the work of cultivation. This is the
[177] outcome of European influences, as a result of which much hand work
has apparently become crude or has been lost altogether. The
"liberation" of commoners from the domination of chiefs, as well as
the realization that one is no longer completely dependent on
cultivation, since flour, meat, sugar, etc. can be bought from the
storekeeper on all the islands, may likewise have determined the
present attitude toward plantation work.

241 The majority of Tongans consume their cultivated products by
[262] themselves, within their own families. At a request, or even on their
[431] own initiative, they will sometimes give of their yield--especially
if there has been a good harvest--to other villagers (not only kinfolk),
241 as in old times. On the small islands they do not, as a rule, sell
438 their produce to fellow-villagers, and in the villages of the larger
184 islands, only occasionally. In the larger towns of Nuku'alofa, Neiafu
432 and Pangai, however, some Tongans sell their tubers, etc. to their
countrymen who have no plantings or only small ones (for example,
government and business officials); some natives on the larger
islands have even started planned cultivation for such purposes (for
241 example, "yam farms"). The handing-over of produce to chiefs, which
565 in ancient Tonga was taken for granted, has been given up almost
178 entirely and has been superseded by the annual payment for the lease
427 651 of land; a native but only seldom on special occasions, will a
431 native bring the chief of his district a gift of select tubers. The
241 old, larger harvest festival (inasi), the offering of first fruits
796 178 to the gods, (406)

406. See E. Gifford, Tongan Society / cited in English/ pp. 76, 345.

241 /153 cont./
796 has long since been forgotten; today the Christianized natives render
178 thanks for their harvests in church.

241 The main crops grown in Tonga today are: yams (*Dioscorea alata* L.), *kapa* (*Alocasia macrorhiza* Schott), sweet potatoes (*Ipomea batatas* Poir.), manioc (*Manihot dulcis* Baillon [?]); taro (*Colocasia esulenta* Schott) and bananas (*Musa* species). The coconut palm (*Cocos nucifera*
L.) is planted to a great extent. In addition, the follcwing [items]
241 are more or less important for the food of the Tongans: breadfruit
262 tree (*Artocarpus altilis*), mango tree (*Mangifera* /154/ *indica* L.), maize (*Zea Mays* L.), sugarcane (*Saccharum officinarum* L.), pumpkin (*Cucurbita pepo* L.), watermelon (*Citrullus vulgaris*), pineapple (*Ananas comosus*), peanut (*Arachis hypogaea* L.), orange (*Citrus* species), papaya (*Carica papaya* L.), *fekika* (*Eugenia malaccensis* L.), *vi* (*Spondias dulcis* Forst.), *tava* (*Pometia pinnata* Forst.), *ifi* (*Inocarpus fagiferus*), *vaine* (*Passiflora* species), *apele* Tonga (*Annona reticulata* L.), *'avoka*, *si* (*Cordyline terminalis*), cabbage, onions, tomatoes. (407)

407. See itemization, p. 234 ff.

241 A "gatherer economy" properly speaking does not exist alongside
222 cultivation. The breadfruit tree, the mango tree, tomatoes, oranges, papaya, *fekika*, *vi*, *tava*, *ifi*, *vaine*, *apele* Tonga, *'avoka* and *si* are not only planted, but also grow more or less wild in the luxuriant growth on the plantations, and these the natives, of course, like to
[137] harvest. (They also gather the fruits of the *kuava* tree *Psidium Guajava* L. which was introduced by Europeans and now grows only wild.)

248 They continue to plant the paper mulberry (*Broussonetia*
249 *papyrifera*) (for making bast fabric), several pandanus varieties (for making mats), tobacco and kava (*Piper methysticum*) for preparing the kava drink. (408)

408. See p. 144ff.

/154 cont./

241 433 184 The following examples from a remote village and from a settlement near a seaport may show the proportion of the various products grown (survey taken April/May 1952):

	Of 97 households engaged in agriculture in 'Uiha/'Uiha (Ha'apai) the following number plant:	Of 42 households engaged in agriculture in Fungamisi/Vava'u the following number plant:
Yams	92	42
kape	83	42
Sweet potatoes	93	13
Manioc	96	34
Taro	93	41
Bananas	89	42
Sugarcane	46	24
Maize	67	14
Watermelons	58	6
Pumpkins	24	13
Pineapples	--	29
Onions	--	3
Cabbage	3	1
Tomatoes	1	1
Peanuts	4	1

241 262 137 /155/ Among the chief crops (yams, kape, sweet potatoes, manioc, taro and bananas) which, together with the coconut palm and the breadfruit tree, constitute the staple food of the Tongans, only manioc is a plant imported during the European period, while all the rest (including sweet potatoes) were favorite food plants even in ancient Tonga. (409)

137 244 Manioc is mentioned for the first time in Tonga in 1865 by West (410)

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409. See J. Cook, Beschreibung...loc. cit. VI. pp. 163, 236/237, 283/284; W. Ellis, An authentic narrative.../cited in English/ I. p. 89.

244 /155 cont./

[137] 410. Th. West, Ten Years..../cited in English/ p. 139.

as a newly introduced plant, and at that time it was obviously of little importance. The conditions for growing of manioc, however, seem to be quite favorable in the Archipelago with respect to climate and soil, so that the plant, the cultivation of which is, moreover, very simple, has since then become widespread. Particularly in the
[134] Ha'apai group where, as a result of over-population, the soil has been
[262] used to excess and is in part exhausted, it has taken on greater importance in the diet of the natives, although they still give preference if possible to their old crops--for reasons of taste and
241 tradition. For the rest, the gifts of seeds left on the islands over centuries by sailors, researchers and missionaries have had relatively little success. Maize which grows well in Tonga is planted in small amounts, and watermelons and pumpkins have not taken on great importance; pineapple is little planted and then mostly to be sold, and there is still very slight interest in onions, cabbbage, tomatoes and peanuts.

242 In the entire Archipelago--even in the Ha'apai group with its over-population--the Tongans have retained their old system of crop rotation with its accompanying "fallow season": after clearing the bush land they plant yams; the second year kape and/or taro (or sweet potatos or manioc) are planted; beginning with the third year they let the land in question rest (for about three years). (411)

411. Sometimes they also plant manioc the third year and only then let the land lie fallow for several years.

A period of fallow is, however, observed only if yams are part of the crop rotations. For example, they plant taro, manioc or bananas continuously or alternate them, so that some land has not had a rest period
241 for several decades. They are not familiar with fertilization, except

/155 cont./

241 for the accidental green manure from decayed parasites on banana trunks and the ashes from burning the slashed and dried wild plants when the
241 land is cleared. The apparently recent but /156/ obvious exhaustion
242 of the soil on several Ha'apai islands, (412)
(134)

412. It is impossible for many land-poor Tongans always to observe the necessary period of fallow.

leads to the fact that here the less exacting, "new" manioc plant is in places planted more abundantly than the demanding yam; on Nomuka, for example, yam cultivation ceased altogether for a time until it was discovered in 1943 that the plant flourished once again. It was on this particular island that the Forsters (413)

413. G. Forster, loc. cit. V. p. 150.

saw an abundance of harvested yams.

242 The planting together of various crops on the same land (for example, yams with bananas, sweet potatoes with kape and bananas) is a procedure already practiced in ancient Tonga, (414)

414. See, for example, J. Cook, Beschreibung... loc. cit. VI. p. 284.

and is apparently based on early experiences of biological suitability.
241 The planting of coconut palms has, however, as a result of copra
245 production by the natives, become greater than in the past; the govern-
178 ment prescribed division of the api'uta into half for coconut palms and
656 half for crops has on some islands shifted to such an extent that some plantations are covered up to seven-eighths with coconut palms in between which bananas, kape, taro, manioc, etc. flourish.

412 The tool the Tongans use for cultivation has changed as a result
241 of European influences, insofar as the old wooden digging stick (huo)
177 that was flattened at the end and was not much wider than two to four inches (415)

/156 cont./

412 241 415. J. Cook, *Beschreibung...loc. cit.* VI. p. 284.

177 was replaced chiefly by two tools that have iron blades: The *huo spade* consists of an oval iron blade, approximately 14 centimeters long, 12 centimeters wide and provided with a socket approximately 17 centimeters long which is stuck onto a strong wooden handle about 1.50 meters long. The natives buy the blade from a shopkeeper and [432] [824] make the handle themselves out of *toa* wood (*Casuarina equisetifolia* L.); in a way, this tool represents the old digging stick, but is more efficient. (416)

416. Th. West already mentions it in 1865. (Th. West, *Ten years*...p. 146); a smaller *huo spade* with an iron handle is seen more seldom.

The huo *lafa-lafa* is a slightly angular thrusting iron (length approximately 13 centimeters, width approximately 18 centimeters, socket approximately 13 centimeters long) with its socket set on a wooden handle (approximately 1.70 meters long); the natives buy the tool ready-made from a shopkeeper and of course replace the handle themselves if it breaks. The *huo lafa-lafa* is used chiefly for slashing weeds on the plantations, sometimes also for digging in loose ground. The large machete (417)

417. See p. 203.

is also extensively used on the plantations, to cut down tough weeds, to harvest various crops, etc. /157/ /Illustrations appear here/ /158/ Sometimes a regular European pitchfork is used to loosen the ground (for example, in planting the stalk-cuttings of the sweet potatoe); one seldom sees European spades or shovels. 241 412 178 184 The ancient Tongan digging stick has survived, in a sense, on the smaller islands where, on the plantations, the natives cut a piece of wood about two meters long, whittle it at the end by one-sided blows with the machete and then use it as a *huo langa* to break up (loosen) the soil in planting *kape* (less often taro or yams).

[TEXT CONTINUED ON PAGE 236]

/157 cont./

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412
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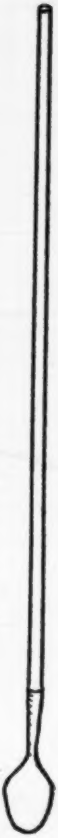
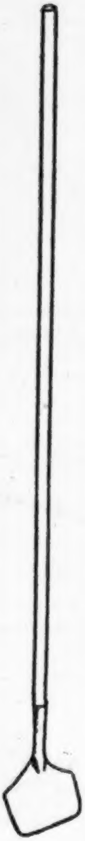


Digging stick with European iron blade (huo spade)
(Expedition collection, No. 93)



Shoveling tool (huo lafa-lafa)
(Expedition collection, No. 264)

/158 cont./

000 kape (less often taro or yams). With these tools they usually work
241 standing. The former, apparently customary, squatting method of work
412
516 (418)

418. See, for example, J. Wilson, A missionary voyage.../cited in English/ p. 245.

407 is used only by a few very old men. Plows as well as other agri-
177 cultural machines and tractors are used by Tongans under the guidance
242 of whites only on the state experimental farms on Tongatapu and on the
property of Crown Prince Tungi on this island.

121 The following survey may give an insight into present-day agri-
241 culture and show the changes that have taken place.

'ufi - Yams (Dioscorea alata L.)

244
262 Even in ancient Tonga yams were one of the most important food
178 plants (if not the most important crop). (419)

419. See J. Cook, Beschreibung...loc. cit. VI. pp. 163, 237, 283/284; W. Ellis, An authentic narrative...I. p. 89.

[563] White employees in the Tongan government have so far discovered 80
[137] varieties of yams in the Archipelago; more than 20 different names are
familiar to the average Tongan. Yams are still the favorite tubers on all the islands, though their total cultivation has decreased in Tonga in comparison with the past (see above); in the Ha'apai group yams are today planted to a lesser extent, whereas their cultivation on the larger islands of the Archipelago (for example, Tongatapu) is still quite extensive and in some places probably corresponds to that of the past.

244 Planting time--with certain shifts as a result of the long north-
221 south extension of the Archipelago--extends from June to the first days
of August and from the third week of August up to October-November. As
244
242 a rule, a yam crop is planted only on land that has rested; suitable

/165 cont./

244 hindered in its growth by weeds or is eaten by horses and rats.

pinati = Peanut (Arachis hypogaea L.)

[137] [262] This was also brought to Tonga by whites. The natives are fond of peanuts, but have so far paid little attention to its cultivation

245 moli = Orange, Lemon, Grapefruit, Tangerine (Citrus species)

[137] Some of these grew in the Archipelago even in olden times (grapefruit!) (434)

434. See G. Forster, loc. cit. V. p. 150;
J. Cook, Beschreibung...loc. cit. p. 236.

and were in part introduced by Europeans. These fruits, with the exception of lemons, are very popular among the Tongans. The moli are planted in the villages as well as on plantation lands, but there they mostly [136] grow wild. On many islands a fruit fly has caused considerable damage to oranges.

[137] lesi = Papaya (Carica papaya L.)

was apparently introduced by Europeans, but a long time ago. Today it is widespread in the Archipelago, grows wild, but is also planted in [262] [252] bush land and sometimes in the villages. The natives are fond of the fruit (raw, cooked or steamed in the earth oven).

fekika = Malayan Apple (Eugenia malaccensis L.)

has probably been indigenous since ancient Tongan times. (435)

435. Perhaps Ellis means the Malayan apple when he says: "a fruit resembling an apple, which we never saw ripe" /quoted in English/ (W. Ellis, An authentic narrative...I. p. 89).

Some of the trees grow wild in the api 'uta, some are planted there. [262] The Tongans love the fruit, but today, as in the past, it is not very important in their diet as a whole.

241 vi = (Spondias dulcis Forst.)

seems to be indigenous in Tonga and largely grows wild on plantation [262] lands. The natives like the sweet fruits.

/165 cont./

245 tava = (Pometia pinnata Forst.)

[137] is said to have been brought to Tonga from the Fiji Islands. (436)

436. See Th. West, Ten Years.../cited in English/ p. 133.

The tree occurs in the wild state and is also specially planted. The

[262] fruits are popular among the natives.

/166/ ifi = (Inocarpus fagiferus [Park.] Fosb.)

occurred already in ancient Tonga. (437)

437. See J. Cook, Beschreibung...loc. cit. VI. p. 284.

[262] The tree is planted, but also grows wild. The natives cook the fruit

[252] and also steam it in the earth-oven, in the traditional way.

241 vaine = (Passiflora speices)

[137] was brought to the Archipelago by Europeans. The fruits of the vaine

[262] are generally planted, but also grow wild, and are eaten raw.

apele Tonga = (Annona reticulata L.)

[137] probably also came to Tonga through European influence. The apele

[262] Tonga is sometimes planted, mostly grows wild. The fruit is eaten raw.

'avoka = (?)

was apparently likewise introduced in Tonga only a few decades ago. On some of the islands the natives like to plant 'avoka, but it also

[262] grows wild. The fruit is eaten raw.

244 si = "Sugar Tree" (Cordyline terminalis)

is a plant that was already indigenous in ancient Tonga. (438)

438. See J. Cook, Beschreibung...loc. cit. VI. p. 284.

The si are often planted on the api 'uta, but also in the villages;

[252] moreover, they grow wild. The root is used: it is steamed in the earth-oven to obtain the sweet juice (by chewing or pressing). The importance of this plant has probably decreased, since today the natives on all the islands can buy cane sugar cheaply from Fiji.

244
137 Cabbage, Onions and Tomatoes,

/166 cont./

244 [137] which were often brought to the Archipelago by Europeans, are planted in very small quantities on the Archipelago. The Tongans have scarcely been able to develop a liking for these useful plants, especially since they do not thrive as a result of the careless and neglectful way they are tended.

489 [361] Since the plantations are sometimes a considerable distance from the dwellings--in contrast to ancient Tongan times--the question of how to transport the harvest (which sometimes consists of many heavy
482 tubers) must be solved. The Tonga often still use old ways of carrying.
178 To transport coconuts, for example, they split the outer skin of the husk like splints, then tie into a bundle four or five splints and carry home on their shoulders two of these bundles by means of a coconut leaf stem (to which the bundles are attached, front and back). Harvested tubers, bananas, etc., are most often carried in the traditional coconut-leaf baskets (kato lou niu) hastily plaited on the plantations, which the natives /167/ likewise carry by means of a coconut leaf stalk (resting on their shoulders and notched so that they can hook the basket on). The coconut leaf stalk is stuck through the basket itself. Often, the handles of the farming tools (for example, huo spade, huo lafa-lafa) are used as carrying sticks. The horse, which was brought
492 [136] [493] [177] to Tonga by Europeans, renders many natives important service as a riding and pack animal, and some natives own two-wheel European carts drawn by horses, which very much facilitate the transportation of even abundant harvests to the villages.

241 178 177 Seen as a whole, Tongan agriculture seems to us little changed. The traditional crops (supplemented by manioc) still form the basis of the food of the inhabitants. The significance of cultivated plants introduced by Europeans is no more than "supplementary." The tools and methods of cultivation are also basically the same, though improvement and additions to the tools, as well as a certain lapse in

/167 cont./

241 the old tidiness on the plantations must be noted. In the matter of
178 transporting the harvest, finally, ancient Tongan methods and thoses
177 resulting from European influence are approximately equal.

Tongan agriculture has undergone no fundamental change, since European influences were not strong and intensive enough, and since the natives themselves felt no necessity to change their traditional, time-tested system.

241 The efforts of well-meaning Europeans to "improve" and change
177 Tongan agriculture were very numerous in the past, but did not become permanent because of the brevity of individual visits of sailors and researchers. At the present time, officials of the British protectorate authority seem uninterested in intensive efforts to influence
241 native agriculture. The two Europeans (an "agricultural officer"
563 /cited in English/ and his coworker) working for the Department of
177 Agriculture /cited in English/ in the more or less independent Tongan
647 government are limited in their effectiveness since they are dependent on the wishes of the Tongans and are also handicapped by a shortage of personnel; moreover, the agricultural officer has frequently been replaced, and every successor has tried out a new program (439)

> 439. At present, the Department of Agriculture finds it most important to improve cultivation (increase yields), to determine the variety of crops most suitable for the particular soil and in future to develop possibilities of fertilization (perhaps bring phosphate from the islands of the Archipelago which are difficult to access, namely, Hunga Tonga, Hunga Ha'apai and 'Ata).

177 /168/ and a new system or work. Nevertheless, through the work of
563 white government officials a good copra export (440)
439 440. See footnote 533, p. 304.

and a good banana export (441)

/168 cont./

177
563
439 441. In 1951, for example, more than 74,000 crates of bananas were exported to New Zealand from Tongatapu and Vava'u.

have been started.

241 For the Tongans, their old crops and agricultural methods suffice.
178 As in old times, the individual scarcely specializes in certain crops. The same things are generally planted on all the islands. With their customary plantation work, to which the Tonga cling conservatively and which, after all, produces good yields for a limited amount of work, they are fully occupied, according to Tonga notions, and not much inclined readily to adopt proposals for innovations. Moreover,
[137] the plants introduced by Europeans were often set in suitable soil and, above all, the very careful maintenance that is often required does not seem feasible to most Tongans.

231 b) Animal Husbandry

In ancient Tonga, pigs and chickens (442)

442. See G. Forster, loc. cit. V. p. 150.

231 were the only domestic animals. Even today, they are still the most
136 useful animals for the natives, even though, since the second half of
177 the 18th century, Europeans have made numerous attempts to naturalize other domestic animals in Tonga. Only the horse was able to achieve a certain importance, since it proved very useful as riding, pack and draft animal for transportation to the distant plantations of some of the villagers. Cattle, goats and ducks are kept by only a few natives, and the importation of sheep and geese was quite unsuccessful. Cook probably brought the first dog to Tonga and it was brought from Fiji at approximately the same time. (443)

443. See J. Cook, Beschreibung...loc. cit. p. 233.

231 Today, one may probably come across dogs in all Tongan villages, though they are not regarded as regular domestic animals by most natives.

G 177 /318 cont./
643 ministers (premier, superior judge, finance minister) and with the
645 help of the Lukiko (native council). The governor of Uganda, as
646 G advisory (or supervisory) authority which represents the Protectorate
635 power has a function similar to the "British Agent and Consul"
648 T /cited in English/ in Tonga, but seems to be even more influential
648 than the latter.

G With regard to the distribution of land it is noteworthy that in
T 648 both kingdoms the English have safeguarded native land ownership, (49)
and that at the same time there were important changes in this area
G as a result of European influence. For, although the Uganda Agreement
648 of 1900 confirmed the landed property of the chiefs who happened to be
423 in power, a sort of fixed and private land ownership (over which /319/
177 an individual owner had absolute right of disposal) was created, which
G had not previously existed. According to the law, the commoners who
423 cultivate the land enjoy greater security, and the duties imposed on
241 them are less than those previously customary. Since almost every
[671] non-landowning Muganda has the ambition to buy the land on which he
[185] works and thus free himself from dependence on the big landowner, a
gradual reduction /in size/ (or distribution) of land holdings has been
brought about, whereby Buganda will gradually become a regular country
T 177 of small farmers. This development resembles that introduced in Tonga
797 in the last century at the instigation of the Wesleyan missionaries,
423 though with the difference that there the natives became tenant farmers
241 whose rights are legally attested and whose plots of land are properties
of the Tongan crown (and owned by the government, the royal house or
the group of nopele).

T G 671 177 With regard to the administration of justice in modern Buganda--

423 177 49. Moreover, Buganda seems to have had little power
of attraction for white planters.

369 drinking and sanitation remains, at best, in a precarious balance
182 with growing urban population.

178 The process of urbanization has several causes which are
[179] significant in the framework of this research. Since the mid-1960s,
[171] the development of tourism, and its associated activities, have
been stressed in the developmental plans of all island governments
in the Southwest Pacific. This has had two immediate results in
178 Tonga. First, many individuals within the agricultural sector of
166 the population have given up their subsistence agricultural activi-
369 [464] ties and moved into urban centers hoping to secure cash employment
in handicraft or tourist related activities. This is particularly
178 the case in Nuku'alofa, Tongatapu and Neiafu, Vava'u. This movement
369 has not only rapidly increased the urban population but has also
433 decreased the total acreage in agricultural production, or changed
[241] production from food crops to cash crops. Others of the rural
population, who remain on their farms, often devote increasing
amounts of time to the production of craft items. However, because
of the rate of expansion in Tongan population, total rural population has continued to increase. Therefore, as rural population
continues to grow, agricultural food production is decreasing and
urban population is rapidly expanding.

369 The second important result of urbanization, without con-
178 sidering the social and cultural impact, is the growing reliance
439 upon imported foods and urban oriented materials (Horine 1967,
p. 43). As urban population increases and agricultural production
of foodstuffs proportionally decreases, food imports become necessary.

439 Many, though not all, of these imports are of little nutritive value
262 and may be actually detrimental to the health of the people. In
262 Tonga, for example, a recent French survey of the capital city
178 revealed a dramatic increase in the consumption of high energy
273 foods, such as sugar, alcohol, and highly processed foods. As a
178 result, the French study concluded, there was a rapid rise in the
164 incidence of dental caries within the Tongan population, accompanied
146 by a general decrease in the overall nutritional status, especially
among preschool children (Hansell 1962).

439 This is not to imply that all food imports are of little
262 nutritive value or that Tonga should strive to achieve self-
000 sufficiency in food production. However, it is clear that some
form of control, governing the quantity and quality of certain
foods, should be considered. Such action should be aimed at
improving the quality of imports, including flour, meats, and
grains. Consideration of the nutritional status of urban popula-
tions is advisable in view of the rapid expansion of this popula-
tion segment and the increasing utilization of imported foodstuffs.

178 The economic shift of the populace is another major cause
369 of urbanization. This shift has been most notable in the agricul-
178 tural sector of Tonga's national economic structure. The effects
369 upon agriculture are felt in two significant areas. As alternatives
● 241 to agriculture are found in cash employment in urban areas, the
[439] cash income of the people involved increases and imported foods,
[262] often seen as status symbols, are sought as such. Therefore, the
per capita urban demand for indigenous foodstuffs tends to decline,

178
369 if imported foods are available and cash is on hand with which to
241 purchase them (Horine 1967, pp. 43-46). In addition, as the pos-
439 sibilities of cash employment in urban areas increases, the popula-
[262] tion is less inclined to work their traditional urban gardens.
Rather, they prefer to raise their visible socioeconomic status
through the use of imports. This subsequently reduces further the
amount of foodstuffs produced in the nation.

241 In rural areas of Tonga, major portions of the remaining
178 agricultural sector are changing to a cash orientation. The govern-
241 ment requires a substantial portion of a farm holding to produce
439 export products (or at least be planted in such), principally coco-
245 nuts or bananas. However, many farm plots are totally devoted to
the production of crops for export (Kennedy 1961, p. 61). Major
cash crops include copra and sweet banana, which together account
241 for 80 percent of Tonga's exports. As is the case in urban areas,
178 as the cash income of farmers increases, the incentive for producing
agricultural food staples decreases. This situation will probably
continue as long as market prices for Tongan exports remain high and
the status associated with material products, including imported
foodstuffs, exists.

121 Therefore, one may hypothesize that as Tonga's population
continues to increase, urbanization will increase, agricultural pro-
duction of foodstuffs per person will decrease, the dependency being
placed upon food imports will continue to grow, and the nutritional
status of particularly urban populations will probably decline.

175 reported that individuals resided within private gardens, separated
361 from each other by fences, or such common boundaries as roads and
trails. Cook, more than a century later, reported a similar pattern of settlement. Such accounts suggest that the island population was relatively evenly distributed over most of the island acreage. Towns, as defined today, were unfamiliar, the population groupings being loosely clustered on land holdings of respective chiefs (Kennedy 1958, p. 162).

178 During the eighteenth century, newer types of weapons were
721 introduced (i.e., the bow and arrow, and a modified throwing spear,
669 [177] from Fiji) and tribal fighting began within Tonga. What began as
[411] small scale conflicts gradually evolved into civil war which involved
361 all the Tongan islands. This period of warfare, which lasted until
178 the 1850s, effectively terminated the widespread house and garden
type of settlement (Kennedy 1958, p. 164). Replacing this tradi-
722 tional system for a limited time was a settlement pattern in which
361 most people resided within fortified structures. The war also
722 disrupted the garden agricultural system, owing to frequent raids
241 from neighboring tribes. As a result, treaties were formulated
between two or more fortified groups, whereby land was guarded, planted, and harvested in common (Kennedy 1958, p. 64).

178 With the close of the civil war period (1799-1852), which
643 lasted for more than a half century, the three principal island
groups comprising the Tongas were unified under the rule of
178 Taufau'ahau (Tupou I). However, the end of hostilities did not
361 signal a return to the traditional house and garden settlement

178 361 pattern. Villages, resembling the modern concept of population grouping, replaced the fortified structures, often being constructed on the original fortress site (i.e., Feletoa and Neiafu).

423 [241] It was during this post-civil war period that the present agricultural system, based upon land tenure, was initiated. Under a decree issued by Tupou I, farmland was divided into allotments of approximately eight and one-quarter acres, or 100 fathoms square. This 'api tukuhau, or rural allocation system, was available to all males over 16 years of age. In addition, the 'api kola, or urban allocation system, provided each family with two-fifths of an acre within a village, for housing. An alternative to the above permitted an individual to waive his rural and urban allotments, in exchange for a larger rural allotment of 12 3/8 acres.

361 The bonds of communal living insured the survival of this nuclear village pattern, despite the fact that some individuals [484] resided a substantial distance from their farm holdings. Within modern Tonga, this pattern still exists as a strongly bound unit, even though this often necessitates as much as 20 miles of travel from village to farm acreage (Kennedy 1958, p. 165).

361
Twentieth Century Population Settlement

162 The population of twentieth century Tonga can be divided into three groups, by pattern of settlement: (1) villages, (2) towns, and (3) miscellaneous groupings, such as school and church facilities.

621 Although the village concept is relatively new to Tongan culture, it serves today as the center of most social and economic

166 rather than move directly into the capital. Movement from these areas into Nuku'alofa primarily involves young age groups, such as school girls attending Queen Salote College.

Two factors stimulate movement from the outer islands. Centrifugal forces push people out of Ha'apai and Vava'u, while centripetal forces pull these people to Tongatapu. The most notable examples of these forces are greater opportunities for social mobility through education, improved transportation facilities between the islands, recent hurricanes in Ha'apai and Vava'u, an outbreak of black leaf streak in Vava'u, and the urban attractions of Nuku'alofa. Each of these forces can be related to economics. Simply, the average Tongan is seeking to improve his economic status to moving himself, if not his entire family, to Tongatapu.

166 These movements to Tongatapu are complicating the already
362 serious problem of land and housing shortages on that island. As a
[591] result, migrants often live with relatives, or within the crowded
substandard dwellings near Nuku'alofa. Examples are especially
prevalent along the major roads between Nuku'alofa and Pea.

166 Interviews with individuals residing under these conditions
revealed two important facts. If employment is secured and a perma-
[591] nent home established, the individual can expect additional family
members and relatives to also migrate and move in with him, result-
● [241] ing in a cyclical process. In addition, it was found that as fami-
lies leave Ha'apai and Vava'u, farmlands are not properly maintained,
due to the absence of male family members, who are usually the first
[162] to migrate. Therefore, the the Kingdom is experiencing a severe

166
162 maldistribution of resident population, with over 50 percent now living on Tongatapu. This situation is compounded by the decreasing
● 241
178 use of arable farmland and a subsequent reduction in the production of indigenous foodstuffs (Fox 1972, p. 5).

311 Several Tongan geographic features are influential in the
[133] distribution of the Tongan population. The western chain of islands in the Tongan group are volcanic and therefore have been settled only intermittently. These islands, usually smaller in size, are less densely settled than the eastern coral islands. Factors, such as the lack of permanent fresh water, and land too steep for anything beyond scattered cultivation, severely limit their settlement poten-
[133] tial. In addition, occasional volcanic eruptions further deter settlement. During the civil war period of Tongan history, most of the western chain islands supported sizable populations. However, only Niuafo'ou and Niuatoputapu continued to support communities
311 into the twentieth century (Walsh 1970, p. 30). A volcanic eruption
166 on Niuafo'ou in 1946 forced its evacuation and most of the village
[133] population from this island resettled on 'Eua. (Niuafo'ou was resettled in 1958.) Recent attempts to settle Kao and Tofua in Ha'apai have met with varied success. Only Tofua appears, at present, able to sustain a reasonable population. However, plans and proposals are occasionally presented for the permanent settlement of Late and Koa, also in Ha'apai.

161 The concentration of Tongan population within towns and
162 villages is expected to continue to be a significant feature of
166 Tongan population distribution. Similarly, a growth in the number

423 subleasing is common throughout the islands, and most frequently,
427 payment is in a traditional means, such as an occasional basket of
taro or yams, or on a special occasion, a small pig.

511 Upon initial inspection, the information presented thus
423 far suggests a land shortage in the Kingdom. However, this interpretation is not necessarily valid. When confronted by statistics
showing less than one-half of the Tongan taxpayers possessing
allotments, several qualifications must be recognized. Misallocation and maldistribution of land certainly exists. However, none of
the interviewed population, even in the squatters section of the
511 capital, appeared to be critically short of food. In cases where
426 land is totally unavailable for household cultivation of vegetables,
431 it is traditional to borrow or receive subsistence foodstuffs from
511 neighbors, friends, or relatives. In this way even the totally
landless Tongans benefit from garden produce. (Food quality does
vary within the Tongan popualtion, and this will be discussed
further within a later chapter.)

241 Borrowing land for cash cropping or purposes other than
434 subsistence food production is rare. In very few interviews with
[423] landless Tongans did the sale of cash crops contribute to the
[425] income of the household, and this fact was often reflected significantly in the income of the landless family. However, landlessness
511 should not be considered synonymous with poverty in Tonga. Land-
434 less households, though enjoying less agricultural cash income,
431 often receive income from more fortunate relatives, in the form of
gifts. (While the most frequent extra-subsidiary expense

434
431 encountered in survey responses was church contribution, the second
most frequent expense was cash gifts to relatives.) In addition,
434 landless households may receive cash from relatives working overseas, most frequently in New Zealand, though also in Australia, Samoa and Hawaii. In a few cases, landless households receive as much or more income from overseas sources than the total income of a landholding Tongan.

● 241 Additional alternatives open to landless Tongans include a
427 variety of sharecropping arrangements, the most common being an agreement to harvest a prearranged quantity of produce, for which no return to the landowner is made. A modification of this is the harvesting of the entire crop by the landless family, and sharing the profits, half and half, with the landowner.

423 Still another alternative enabling landless households to
427 obtain land is the paying for such through an unofficial rent system.
[685] The renting or leasing of land under this arrangement is, strictly speaking, illegal. However, use of land is often granted in exchange for gifts of vegetables, pigs, labor or even small amounts of cash paid to the landowner.

423 The landless element in Tonga is rapidly growing, and undoubtedly will become a major social and economic issue in the Kingdom's future. However, at present, significant or widespread social unrest related to the issue of land tenure is not evident.
423 Of those interviewed, 21 percent believed the present land tenure
829 system to be unsatisfactory, due to the lack of sufficient land.
This opinion was not restricted to landless households, but was

423 expressed by landowners, as well. However, only 0.3 percent of the
829 sample expressed the opinion that the tenure system should be
reorganized. Though this appears to be contradictory, most informants, when pressed on the issue, implied that the land tenure system was based on tradition, and would not change.

511 Considering these features of the system, the following conclusions may be formulated. Although landlessness exists on a large scale throughout Tonga, few landless households suffer critical hardships resulting from land shortage. Most landless individuals consider their income sufficient for household needs. An occasional landless family enjoying remittances from abroad or who derive income from fishing or labor may even achieve an income level above that of the average allotment holder.

121 Land tenure must also be considered in terms of its role in
the nation's agricultural economy. Although an in-depth analysis of
Tongan agriculture is contained within the following chapter, its
relation to land tenure can be considered within the framework of the
[457] present section. The major issue which arises is that concerning
the basis for the development of cash cropping, which is vital to
Tonga's balance of payments.

241 Cash cropping has been largely confined to the production of
245 bananas and cocnut products. This does not mean that other cash crops
245 are being rejected, owning to land tenure. At the present, several
attempts are being made to develop the cultivation of vanilla and
[439] citrus as cash crops. Nonetheless, the great majority of export

245
439 capital earned by cash cropping is the result of banana and coconut
product sales.

Prior to 1965, the slowness with which allotments were
245 registered and the incomplete subdivisions of larger landholdings
423 hindered the expansion of both the banana and coconut crops. Many
informants expressed a reluctance to plant their land with such
long-term crops as coconuts, until their allotments were registered
245 with the Ministry of Lands, and their tenures secure. Large scale
banana production was postponed for the same reasons. Under these
circumstances, the cultivation of short-term food crops has been
conducted on land often sparsely planted or devoid of coconuts.
[654] Since 1965, and the initiation of the Coconut Replanting Scheme, a
major effort supported by the government, a marked increase in the
area planted in coconut palms has resulted. This, in turn, has
241 encouraged some farmers to cultivate bananas also. Therefore, it
245 appears that the basis for developing cash crop agriculture, within
the present land tenure system, is sound. However, expansion will
likely fail to meet its potential unless the tenure system is
strictly applied and implemented, as stated in Tongan law and
theory.

241 According to survey respondents, the single major limiting
433 factor to increasing agricultural production is the lack of land.
Many farmers expressed a willingness to increase production, if land
241 was made available and secure to them. Assuming this willingness to
423 be reliable, the tenure system limits the average farmer to eight and
433

241 one-quarter acres, except for the above mentioned modifications, and
423
[433] thus significantly limits the future expansion of cash cropping. In
[425] some cases, this has led to the borrowing of land, whereby the
borrowed land is used for family food production, while intensive
cash cropping is carried out on the borrower's individual allotment.

241 Despite the above deterrents, agriculture remains the funda-
433 mental basis of the Tongan economy. The following chapter contains
128 an indepth analysis of this agricultural activity.

CHAPTER V

AGRICULTURAL PATTERNS

The Traditional System

● 241 Economically, Tonga is supported primarily by agriculture.
433 Production of primary agricultural products accounts for approxi-
[464] mately 65 percent of the nation's employment and the majority of
[439] all export earnings (96 percent in 1969). In addition to subsis-
[245] tence cropping, bananas and coconut are most frequently raised as
245 cash crops. Copra is currently Tonga's major agricultural export,
439 seconded by bananas. While the export value of bananas was greater
than copra in 1967 and 1968, the occurrence of diseases, which
affect the banana plant, permitted copra to regain its dominance.
245 Copra is expected to remain the major agricultural cash crop in Tonga,
during the near future.

241 Most Tongan men earn their livelihood as farmers, having
434 three basic production activities. Production of subsistence crops
for family consumption is the major concern of the majority of these
men. Additional production activity concerns crops for local sale
and crops for exportation to international markets.

463 Table 13 presents the major labor divisions within the Tongan
162 Kingdom. While only 66.5 percent of the male population is engaged
[241] in agricultural employment, recent surveys indicated that a majority
of the remaining work force are also part-time farmers, producing

463 TABLE 13.--Economically Active Males Over Age 15 Classified According to Industry in Which Engaged: 1966.
162

Industry	Total Number	Percent
Agriculture	13,827	66.58
Commerce	180	.86
Transportation and Communication	334	1.60
Services	1,715	8.25
Manufacturing and Processing	579	2.78
Government and Administration	124	.59
Domestic	33	.15
Unclassified	3,974	19.19
Total	20,766	100.00

SOURCE: S. M. Fiefia, Report of the Results of the 1966 Census (Nuku'alofa: Government Printer, 1968), p. 72.

463 food crops for home consumption, plus some meat, such as pork and
241 goat. As outlined in the previous chapter, virtually all Tongans
[162] are tied to the land and only rarely is a household encountered where the production of at least garden crops does not exist. However, the use of imported food commodities is increasing, particularly in the urban areas. This will be discussed in greather depth within the following chapters.

241 Agriculture is usually the work of men, although it was fre-
592 quently observed that an entire family may travel to its rural 'api
462 and spend several days working together. Men usually do the heavier labor, such as clearing and preparing the land for planting. While

241 592 462 [857] the primary duties of women are cooking, cleaning and looking after the children, they may also assist in the planting and tending of crops. A rigid social division of domestic duties was not observed in Tongan culture, and often men or older children were seen cooking or tending the children while women labored in the household garden.

241 Tongan agriculture is based upon a bush fallow system. The terminology "bush fallow," in this investigation, is used to denote the Tongan form of shifting cultivation, in which a fallow period is included between cycles of cropping. This system is used primarily in the production of tubers for home use or local market sale.

The bush fallow cycle begins with the selection of a portion of the 'api for clearing, burning-over, and planting. The selection is based upon the requirements of the crop to be grown, in relation to the characteristics of the available land. For example, low swampy land is usually planted in taro, while yams require better drained, loose soil. Following selection, the land is cleared, a procedure which often involves little more than cutting small undergrowth, using a bush knife (Plate 1, p. 73).A

134 Most Tongan soils are the result of weathered volcanic ash and are 60 to 90 percent clay. The soil structure is strong, as indicated by its formation and friability, very permeable, and generally exhibits characteristics of favorable tilth. Most Tongan soils are also high in calcium, magnesium and potassium. Phosphorus, generally fixed and immobile, is therefore unavailable in large quantities, although enough is released at a constant rate to

A[Plate has not been marked for a Category because of poor quality of the reproduction--Analyst.]

134 provide for crop needs.[1] The practice of burning-over land, which
241 follows clearing, represents a significant factor to soil composi-
134 tion. This constant burning severely limits the amount of humus in
the soil and acts to reduce the amount of available nitrogen
241 (Hougland 1974). A further negative effect of burning is evident in
245 cash crop production. Improper timing of the burning process often
results in damage to coconut palms, thereby reducing the number of
nuts produced. Several 'apis were observed where burning had totally
destroyed the immature nuts of producing palms.

241 Following burning, very little ordering of the land is done. Occasionally, a farmer may rent a small tractor to plow his land, but usually the cost is prohibitive or the procedure is considered unnecessary. The planting of crops in Tonga involves little more than digging a hole in the soil, planting, and leaving the crop largely untended until maturity. Few farmers effectively weed more than the immediate planting site, and planting often follows no pattern of rows or other orderly arrangement.

[242] Tongans evaluate land fertility by the presence of such wild
vegetation as weeds and grassus, plus previous experience with the
[425] given land. However, land shortages in the more densely populated
areas often limit the choice of planting sites, and even in cases
where land is borrowed, usually only the poorer land is lent, and
thus secured for planting.

---

[124] [1] This information was obtained from an examination of Tongan soil, in conjunction with interviews conducted at the Tongan Government Experimental Farm.

241 Yams are the first crop produced during the cultivation
244 cycle, given sufficiently fertile soil. Most farmers interviewed
stated that they grew two crops of yams on a given planting site,
before proceeding to the next cultivation stage. Interplanted with
the yams are a variety of other miscellaneous vegetables, bananas,
kape (i.e., giant taro), or plantains. In densely populated areas,
such as western Tongatapu, taro is occasionally interplanted also.
In regions in which sandy soils prevail, sweet potato instead of yam
often starts the planting cycle. This is usually followed by
bananas, plantains or cassava.

Following the yam harvest, taro, cassava or sweet potato
is planted. While surveys indicate that there is no established
pattern or sequence of cropping following the yams, taro was found
to be the usual second crop. Most farmers produce two plantings of
the second crop prior to the third cultivation stage, which most
often involves the production of cassava. Up to six croppings of
cassava are produced, although this figure is not the norm. Cassava
is occasionally found sparsely planted on fallow land, or growing
wild, especially in the densely settled areas of Ha'apai, where the
241 fallow period is much shorter, owing to less available land. An
almost endless number of variations of planting and intercropping
[244] was reported by individual farmers. However, as the first planting
was usually yams, the last planting was usually cassava, for reasons
of soil depletion and the ease of cassava production (i.e., the lack
[245] of tilling, weeding, and grass control). Only occasionally did the
sequence end with bananas, rather than a tuber.

241 Two features of the bush fallow system of particular interest
are crop interplanting and crop succession. Interplanting was
found to be practiced by over 90 percent of all landowning farmers
engaged in cultivation. When questioned as to the reasons for this
practice, the most frequent response concerned a desire for increased
production on limited land. However, several additional advantages
were observed. Interplanting reduces farm labor requirements, in
242 terms of weeding, to only minor maintenance activities. Interplanting
241 also retards soil erosion, such as on the steep slopes of Vava'u
and the more sandy soils of Ha'apai. In addition, it is believed that
the soil nutrient requirements of interplanted crops are frequently
complimentary, although this was not tested.

The cycle of crop succession in Tonga is primarily based
upon a farmer's knowledge of his land's condition and fertility,
241 plus the fertility requirements of individual crops. Yams are
242 planted first because they require a loose soil, such as is found following
244 the clearing process, and a higher soil fertility.

Taro and cassava, the most frequently planted second and third crops, are less demanding on soil fertility. Cassava is particularly notable in this respect. Thus, in the more densely settled portions of Tongatapu and Ha'apai, where the fallowing periods are much shorter and, consequently, soil fertility is lower, cassava is more frequently cultivated.

241 Tuber cultivation, such as for yam, taro and cassava,
[244] represents the principal farming activity in the Kingdom's food production.
[245] However, several supplementary crops are noteworthy, the

241
245 most important being coconut. The coconut, though representing the
majority of cash-earning export production, is also an important
[262] domestic food source. Coconut flesh and cream are integral parts of
[824] practically every Tongan meal. In addition, products of the coconut
palm are also important to other aspects of Tongan life, from house
construction to production of a shopping basket for marketing.

241
249 A second important supplementary agricultural crop is kava.
276 The roots of this plant are dried, pulverized, and mixed with water
to produce what could be called the Tongan national beverage.
Although the taste is somewhat alien to a non-Tongan palate, the
only observed immediate physical effect of this drink was a slight
[142] narcotic quality.[1] Prolonged consumption, however, was noted to
cause a darkening and scaling of the skin, evidenced in some older
Tongans.

241 A third supplementary plant is the papaya, which is only
245 infrequently cultivated for its fruit, and usually grows totally
262 unaided. While foreigners find the papaya to be a welcome addition
to the principally tuber diet of the Tongan, it is, strangely, a
262 native food viewed with low status. Few interviewees admitted to
231 consuming papaya regularly, and frequently described the fruit as
being pig food.

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[1] On several occasions young Tongan men, having consumed a large quantity of the kava drink, or "Tongan beer" as it is commonly referred to, were observed to be thoroughly intoxicated. However, experience indicated that enormous quantities of the drink are necessary to produce anything more serious than a mild headache. From all indications, the intoxicating effect is quite simply psychological, rather than physiological, although all Tongans questioned will attest to the contrary.

● 241 Cash cropping (to be discussed in greater depth later in this
chapter) in the bush fallow system can be divided into long- and
241 short-term crops. The principal short-term crops include bananas and
245 a variety of melons, plus miscellaneous plants. Bananas, as
[244] described above, may be interplanted in the normal planting cycle.
Usually, banana cropping is continued for several years before a
245 plot is returned to fallow. Production from this crop is allocated
[262] to household consumption, or sold in local markets. Surveys encountered
[438] only an occasional farmer producing bananas for the international
[439] export market. Subsequent interviews indicated several limitations
on this type of production, such as plant disease and inadequate
shipping facilities.

The most severe diseases affecting banana production are black leaf streak, bunchy top, and banana scab moth, the most serious being black leaf streak. Decreases in the production of exportable bananas since 1967, equaling 83 percent of the 1967 crop, have been attributed largely to this particular disease. Leaf streak is a fungal disease, characterized by a dark streaked appearance on the plant leaf (Plate 2).[A] The disease, by decreasing the total leaf area of the plant, thereby reduces the plant's photosynthetic capacity. The results are smaller fruit, smaller numbers of fruit per bunch, or frequently the complete absence of fruit.

Banana bunchy top is a viral disease, also reducing the photosynthetic area of the plant. It is characterized in the field by the insequential order in which the plant leaves die and the bunched appearance of remaining leaves (Plate 3, p. 74).[B] Bunchy top

A, B [Because of poor quality of reproductions in the original, plates have not been marked for a Category--Analyst.]

[TEXT CONTINUED ON PAGE 75]

245 retards the growth and development of the plant, and terminates
fruit production.

[136] Banana scab moth, most destructive during its larval stage,
may cause damage ranging from simple fruit discoloration to total
[242] destruction (Plate 4, p. 74).A DDT, which is frequently used to
combat scab moth, has been ineffective in annihilating the pest.

241 The combined effect of these three diseases have reduced
245 internationally marketable banana production by nearly 1.5 million
[433] dollars, representing approximately 30 percent of total agricultural
[439] export production since 1967. Farmers are increasingly hesitant
to initiate large scale banana production, unless guaranteed
assistance in combating disease and plant destruction.

245 Survey interviews also attributed decreasing banana produc-
505 tion to inadequate shipping facilities. Frequently, harvested
bananas are placed on a dock to await the arrival of transport
245 vessels destined for overseas markets. During this time, the fruit
439 becomes over-ripe, falling below export quality. As a consequence,
[435] fruit originally priced up to $1.90 per case may be sold for as
little as 40 cents. Because of this potential low cash return,
245 many interviewed farmers stated that large scale banana production
was an unwise economic risk.

244 Commercial production of melons, especially watermelons, is
also hindered by the inadequate scheduling of transport facilities to
[505] overseas markets. Melons are also produced for Tongan markets, but
[438] frequently earn only low prices, even when out of season.
[435]

A[Because of poor quality of original reproductions, plates have not been marked for a Category-- Analyst.]

249 Of the miscellaneous crops produced, two are particularly
● [241] noteworthy--sugar cane and peanuts. Sugar cane is frequently produced
on the farms of Vava'u, although limited cultivation may be found
[257] throughout the nation. Sugar for domestic consumption is not produced
in the Kingdom, and mature cane is sold in small unprocessed sticks,
much like candy.

244 Peanuts have a great potential for expanded production in Tonga. The presence of a domestic market for peanuts is apparent throughout the Kingdom, and the potential dietary value of this product should be recognized. Employees within the Tongan Ministry of Agriculture blame the lack of extensive peanut production on the laziness of individual farmers. On the other hand, farmers refuse to plant peanuts without guaranteed aid for the necessary machinery and fertilizers.

245 Coconut is the best example of long-term cash cropping.
[439] Products of the palm, principally copra, equal approximately 85
[241] percent of Tonga's total international export. Cultivation of palms
is conducted independently of the food crop planting cycle. If
well cared for, young palms will reach initial production four to six
years after planting, although seven to nine years was frequently
reported in interviews as being the time required prior to production.
The coconut palm will produce for up to 70 years, with 50 to 60 years
[136] being the norm. However, rats and beetle damage claim up to 25 percent of all potential produce.

241 Palms are often not planted in an orderly fashion on a
245 typical 'api, being planted in a seemingly random distribution. An

● 241 An
245 aerial analysis of Tongatapu, and a subsequent comparison with
171 Western Samoa, revealed a marked difference in planting and cultivation.
Portions of Samoa reveal an orderly planting configuration,
241 suggesting more devoted commercial production of coconuts. Tongan
245 farmers, when questioned about the uneven planting, noted that they
can produce much larger tuber crop yields if sunlight is not blocked
245 by closely planted palms. However, loosely defined and enforced
Tongan laws requiring palm cultivation, plus the desire for a cash
income, have motivated an increasing number of Tongans to plant
their entire landholding with coconuts.

245 It was noted in such cases that extensive coconut production
241 is accompanied by smaller gardens and less rotation of crops. This
[438] subsequent reduction of tuber food crop yields is compensated by the
purchase of foodstuffs in neighboring village or urban areas. In
Ha'apai and the more densely settled portions of Tongatapu, an
occasional interviewee reported the necessity of planting entire land
[262] holdings in coconuts to insure a cash income. Increasingly, incomes
[439] from cash crops are providing households with diets of imported foodstuffs,
replacing those of traditional crops.

The possibility of subsistence crop production in conjunction with coconut planting is largely dismissed by Maude (1970). While coconut yields can be temporarily improved by the occasional clearing of bush for gardens, the burning of the cut vegetation scars the palm and severely reduces production. In addition, once the planting cycle is complete and fallowing begun, vegetation is allowed to grow around the palms unhindered. This growth not only competes

241 for plant nutrients and soil moisture, but also hinders collection
245 of nuts (Maude 1970, p. 60). Similarly, planted food crops also
[435] compete for soil nutrients, and none of the interviewed farmers
reported using significant amounts of fertilizer, owing to rapid price increases. Only when coconut production is profitable enough to pay for increased fertilization is interplanting of significant value.

In addition, when interplanting is practiced, the potential for the reduction of both coconut and subsistence crop yields exists, due to competition for moisture, shading, and damage to the root system of the coconut. Maude concluded that there is, as yet, no satisfactory integration between the bush fallow food cropping system and the coconut plantation (Maude 1970, p. 60). Therefore, as the development of cash cropping continues, through enforcement of palm cultivation laws or simply the farmer's desire to insure a larger cash income, a significant alteration of Tongan agricultural society will emerge.

245 The increased planting of palms since 1965, initiation by the
Coconut Replanting Scheme, has brought about an increase in the cash
241 income of Tongan landholders. However, owing to the incompatibility
262 of bush fallow and plantation cultivation, the landowners' production
of foodstuff for home use is increasingly curtailed. As a result, the increase in cash income is frequently used entirely in the purchase of food from village or urban markets. The dietary and nutritional implications of this alteration will be discussed in the following chapters.

241 Survey information covering the 1973-74 cropping year indica-
242 ted only scattered and infrequent use of any type of pest control by
Tongan farmers. Only 25 percent of those farmers surveyed used
[654] spray or dust pesticide of some type. Most often this was DDT,
supplied by the Tongan Department of Agriculture. Application of
this was usually concerned with combating the scab moth for banana
production. The expansion of cash cropping, whether in plantation
or bush fallow production, is significantly limited by this lack of
pest control.

Food cropping for home use, mainly tuber production, does
not notably suffer from pest destruction, with soil fertility deple-
tion being the major cause of reduced yields. Fertilizer is beyond
[435] the economic means of the typical Tongan farmer. The cost of basic
fertilizer, such as urea, increased from $120 to $220 per ton in
[654] 1973-74 (Hougland 1974). Of the total survey sample of farmers cul-
tivating land, only two percent used any kind of fertilizer, and it
usually was supplied by the Tongan Agricultural Department. More
readily available sources of fertilizer, such as green manuring or the
spreading of animal manure, are untraditional in Tongan farming and,
therefore, unfamiliar and unused. The bush fallow system remains the
major technique employed in Tonga to increase soil fertility.

241 In the bush fallow system, a given plot undergoes a cropping
cycle of up to seven years. Declining yields during this period make
continued cultivation unprofitable, and the garden area is shifted
241 to another portion of the 'api. Nitrogen depletion appears to be
134 the major cause for crop yield reduction. Maude (1965) reported no

241 significant difference in nitrogen concentration between plots which
134 had been cropped for long periods and those in fallow. In conclusion, Maude finds no specific reasons for declining yields or the effects of cropping on soils, which might necessitate rotation (Maude 1965, pp. 135-136). However, several points must be considered. Phosphorus in Tongan soil is primarily fixed and immobile, and therefore is a direct influence upon the amount of available nitrogen, as opposed to total nitrogen, used in plant growth. Interview information indicated that phosphorus is released very slowly and, therefore, in fallow periods with less demand, may build in-soil concentrations, or be contained in fallow vegetation. This concentration of phosphorus creates a subsequent increase in available nitrogen, rather than total nitrogen, used by plants in fallow or to be cropped.

241 The principle behind the bush fallow system (i.e., the increase of available nitrogen) is negated by excessive weed and grass growth during the fallow period, which extends from three to six years. Wild grasses, which grow during the fallow period, are
[137] the most demanding on soil nutrients. The most common of these grasses are nut grass (nut sledge), guinea grass, and Johnson grass. Nut grass presents the greatest concern, owing to its difficulty of
241 control and its competitiveness for available nitrogen. It is
134 believed that unless some control of weed and grass growth is carried out during the fallow period, the peak of nitrogen fertility being returned to the soil by fallowing is reached in approximately three years. Beyond this time, fallowing seemingly enters a period of

241 diminishing return, during which nutrient demands upon the soil by
134 weeds and grasses are equal to or greater than that being restored.

As stated previously, a further complication to soil fertility results from the traditional practice of burning-over the land, prior to initiating the planting cycle. The burned vegetable residue represents a return of a thin layer of mineral ash to the soil, consisting primarily of calcium, magnesium, phosphorus, and potassium. With the addition of rain and new plant growth, these mineral components become mobile within the soil. However, the nitrogen contained in the fallow vegetation is lost in the burning process, and therefore not returned to the soil. Thus, available nitrogen for crop production may actually be reduced.

241 The fallowing period may last from one year to as long as ten years. Examples of these longer fallowing periods were encountered in interviews, as well as occasional plots which had never been fallowed. The average time schedule consists of three to six years in fallowing and two to four years in cropping. However, no farmer reported following a predetermined schedule, basing decisions upon crop yields.

241 Variations in the length of time allotted to cropping and
182 fallowing were noted in relation to population density. In Ha'apai
and western Tongatapu, where land shortage is related to population
density, relatively short periods of fallowing are followed by
[244] longer periods of cropping. In addition, the practice of retaining
cassava growth, and occasionally taro, on fallow acreage was noted
in these regions. Explanations for this, presented during interviews,

241 ranged from spontaneous growth to a safeguard against periods of
182 food shortage.

241 Entering land into fallow was found to be a gradual process.
Tubers, and occasionally bananas and plantain, may continue to be
harvested from the plot for several years after the cessation of
active cultivation. Coconuts are also produced in fallowing plots,
independent of the bush fallow system.

Increasingly, in more densely populated areas of the Kingdom, this combination of fallow and cropping is being practiced,
whereby a farmer plants cassava on the fallow plot and allows
grasses and weeds to grow unhindered. The only incidence of weeding is at the time of planting and then in only the immediate planting site. This activity may last for several years, or occasionally
for the entire fallow period, followed by the planting of yams or
[23] taro. Only in western Tongatapu was the addition of any fertilizer
(an occasional application of small quantities of pig manure)
noted.

241 Fallowing is traditional to Tongan agriculture. However,
178 due to population growth in many areas of the Kingdom, increasing
[182] demand for land is modifying the fallow system. Surveys indicated
an average fallow time of three to six years. It was the opinion
of over 81 percent of those farmers interviewed, and who had land
in fallow, that the average fallowing time is evidencing a slow but
[434] steady decrease. Farmers are finding it necessary to devote more
of their acreage to some form of semi-permenant cultivation, in
order to meet subsistence requirements, or to secure an adequate
level of cash income through local sale of
produce.

241 level of cash income through local sale of produce. Many of the above farmers were those who expressed dissatisfaction with the land tenure system. Tracts of long-term idle land adjacent to leased intensively cultivated plots is a growing source of embitterment.

The typical 'api allotment is subdivided into several plots, at various stages of the bush fallow system. For example, the average farmer cultivates two or three plots, which usually differ in the age and crops being grown, while several plots are simultaneously in various stages of fallow. Thus, land at all stages of the agricultural cycle may be found in the typical allotment. Figure 1A illustrates a bush allotment of eight and one-quarter acres, indicating the variety of plantings and fallow. Figure 1B is typical of the smaller holdings in Ha'apai and western Tongatapu. The smaller fallow area and shorter fallow time are indicative of increased population pressure and the subsequent increased land use.

241
461 Labor requirements of an 'api vary greatly as to the amount of cultivation and the crops being produced. Interview responses indicated extremes from five 8-hour work days per week, to as little as three hours per weekend. The average for cultivating farmers, however, is 3.75 hours per day, or less than one-half day. No particular routine was noted, the Tongan farmer usually laboring only upon impulse.

241 Although lack of land was a frequent explanation for the difficulty in increasing agricultural production, another prevalent

101: Clark K-4,5 (1974) 1978 OU9 Tonga OU9

102

241 Figure 1.--Planting of the Tongan 'Api.

1A. 8.25 acres

1B. 4.76 acres

SOURCE: R. R. Thaman, "The Role of the Tongan Agricultural System in Fulfilling the Subsistence Needs of the Tongan Society," R. W. Parkinson Memorial Lecture, School of Social and Economic Development, University of the South Pacific, September 26, 1974.

101: Clark K-4,5 (1971) 1978 OU9 Tonga OU9

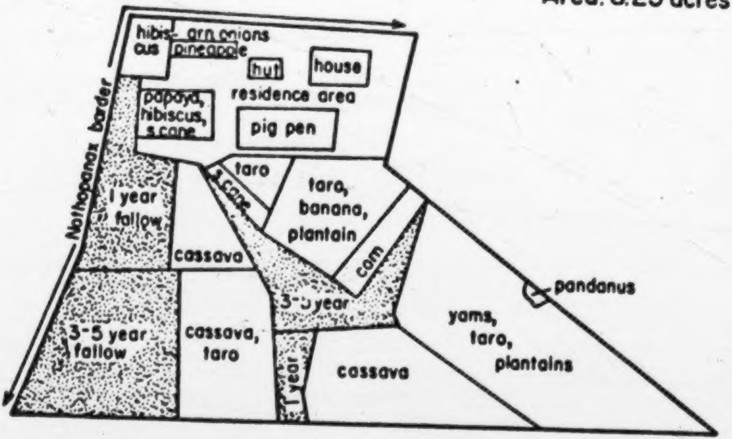
102

241

DISTRIBUTION OF MAJOR CROPS AND FALLOW

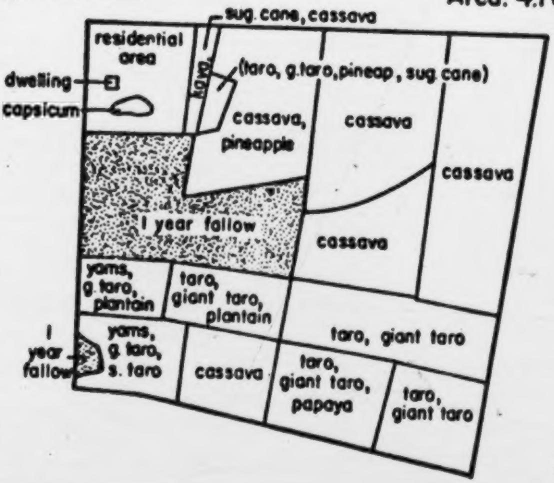
Sample Bush Allotment

Area: 8.25 acres


hibiscus
grn onions
pineapple
hut
house
residence area
papaya, hibiscus, s.cane
pig pen
Nothopanax border
taro
s.cane
taro, banana, plantain
1 year fallow
cassava
corn
3-5 year
pandanus
yams, taro, plantains
3-5 year fallow
cassava, taro
1 year
cassava

Sample Bush Allotment

Area: 4.76 acres


sug. cane, cassava
residential area
dwelling
capsicum
kava
(taro, g.taro, pineap, sug. cane)
cassava, pineapple
cassava
cassava
1 year fallow
cassava
yams, g.taro, plantain
taro, giant taro, plantain
taro, giant taro
1 year fallow
yams, g. taro, s. taro
cassava
taro, giant taro, papaya
taro, giant taro

241 factor in Tongan society reduces the incentive for increased
241 production. Individuals who manage to significantly increase their
571 production of crops or agricultural profits are under social pres-
426 sure to supply loans and miscellaneous obligations to close rela-
tives and friends. This practice severely reduces the independence
of the farmer. Several informants stated that they would not
increase crop production because neighbors and relatives subse-
426 quently "borrow" all extra produce. Although lending is a tradition
556 which increases the social status of the lender, resentment toward
178 this social obligation is increasingly expressed among younger land-
holders, who place higher esteem on cash than tradition.

241 At present, the typical farmer appears to work his 'api an
461 average of 18 to 20 hours per week. The remaining time is occupied
[125] by a variety of additional activities. Although statistical evidence
of the duration of each activity was not collected, three activities
241 appeared to be dominant. Owing to the distribution of population
461 and the subsequent pattern of settlement, a farmer often spends
484 several hours per day traveling to and from his 'api. Travel
extremes from zero to 21 miles were reported by interviewees. Occasionally, informants reported leasing land on nearby islands, which
necessitated travel overland, as well as by boat. However, an
average of 6.75 miles was determined to be the distance necessary
[494] for the typical farmer to travel to his 'api. Although the principal
islands of the Kingdom have bus transportation, the busses average
no more than 15 miles per hour, thereby consuming at least an hour
of travel per day for the average farmer. Frequently, walking for

241
Frequently, walking for
461 another hour follows the bus ride. Transport of crops from the 'api
484 usually involves greater lengths of time as the common method con-
494
[481] sists of a horse-drawn cart (Plate 9, p. 93).^A

Fishing is a second significant activity conducted away from
226 the 'api, although of less concern within the interior of Tongatapu
[461] and along those shores with poor sources or access. In Vava'u and
[262] Ha'apai, fishing often consumes several hours per day, and supplies
[438] not only family food needs, but also enough for sale in local markets.

461 A third major activity concerns church and social functions within the local village or the nearest urban area. Many of these activities are concentrated during the weekends, such as marketing and major church functions. However, social activities during the week require participation of several hours per week.

In addition to the above, an entire range of miscellaneous labor must be considered, due to the low level of specialization of
461 labor in Tonga. Thus, to summarize, it is evident that potential
241 expansion of agricultural production in Tonga involves not only issues of land tenure and management, but also individual incentive, tradition and the amount of time devoted to agricultural activities.

During interviews conducted on all of the major Tongan islands, lack of land was most frequently denoted to be the major limitation upon agricultural expansion, while laziness of Tongan
241 farmers was the second most frequent response. The third most
412 frequent explanation concerned the lack of adequate agricultural tools and machinery. An examination of farm equipment, either owned or rented by the interviewees, indicated that most farmers possess

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A [Due to poor quality of original, plate has not been marked for a Category—Analyst.]

241 [412] [407] [426] [427] only basic agricultural tools, such as a bush knife, hoe, planting stick, and spade (Plate 10).A Beyond these, little else is used for cultivation. Of all landholding Tongans surveyed, only 16 percent used a plow or tractor and, in each case, the implement was either rented or borrowed.

407 407 493 493 398 493 398 The maintenance of agricultural machinery, in terms of efficiency and materials (i.e., fuel, parts, and lubricants), severely limits the possibility of increased use within Tonga. Interviews within the Tongan Department of Agriculture indicated that this problem reaches every level of agricultural operation, from trucks to garden tilling machinery. For example, a large truck was cited as having not been used for over 18 months, because of a broken transmission gear. The required part, ordered from Japan, had not yet arrived and no one knew if it ever would. In the interim, no attempt to make the part, in one of the local blacksmith shops, had been made. It was confidentially learned that, should the part arrive, the truck would remain largely inoperative because of another damaged gear which was not totally broken and, therefore, not replaced. Other examples of this situation were noted, emphasizing the serious lack of basic mechanical service.

241 427 [557] 241 When workable machinery is available for rent, the cost is often prohibitive to the average farmer. Informants also complained that rental machinery is allocated on the basis of social standing and status, rather than need. Thus, the majority of planting, cultivation, and harvesting on Tonga remains the work of hands, and is expected to remain so.

A[Due to poor quality of original reproduction, plate has not been marked for a Category--Analyst.]

231 cover, which is attractive to rats. However, the initial expense
245 of cattle, plus continued capital outlay for maintenance, substantially
reduces the profitability of this scheme.

231 Goats were owned by 27.5 percent of the total survey
[241] sample. Although a potentially valuable source of meat and milk,
roaming goats cause considerable crop damage in Tonga. The goat is
one of three scavengers, competing with pigs and fowl for household
[262] refuse and other edible items. While goats are occasionally used
[431] for meat on special occasions, the pig is considered to be a much
[272] more prestigious food or gift. In addition, because of the low
status ascribed to goats, use of goat's milk is avoided. Thus,
the role of the goat in Tongan agriculture is expected to remain one
of little significance.

Pigs are the most prestigious livestock raised in Tonga, and
[262] were owned by 55 percent of the survey sample. As mentioned previously,
[431] the pig is a meat source used for important social functions
and traditional gifts. Being the most common of Tongan livestock,
the pig plays an indispensable role in the control of garbage and
refuse, plus provision of meat protein. Most households own
several pigs, raising them as a food source or as a means to fulfill
[436] a variety of social obligations. It is not uncommon for taxes,
debts and other financial obligations, especially to the nobility,
[262] to be paid with one or more pigs. Pork is not included in the
average Tongan weekday diet, being consumed primarily during main
Sunday meals or at feasts.

231 frequently nonexistent and the well-being of large numbers of pigs, goats and fowl throughout the Kingdom depends greatly upon scavenging.

237 An advantage of livestock production almost totally neglected
241 in Tongan agriculture is the production of manure. The process of
applying manure to soil is not traditional in the Tongan agricul-
tural cycle, and the basic concept is, for the most part, not under-
237 stood (Hougland 1974). Annual manure production per animal varies
as to diet and amount of feeding. Table 16 indicates the amount of
potential fertilizer (i.e., animal manure) which can be returned
to the soil. Table 17 provides additional data, including the
amounts of the three macro-nutrients available per ton of animal
237 manure, essential for maintaining soil fertility.[1] Collection of
241 manure would require containment of stock, or at least confinement
to the boundaries of the 'api, thereby bringing about direct return.
Only a small minority of Tongan allotments are fenced, the required
cost and labor being considered excessive.

231 Livestock is expected to retain its traditional role in the agricultural system of Tonga. The potential upgrading of stock, as well as the full utilization of this agricultural component, is directly determined by Tongan farming traditions. Thus, while fulfilling an unintentional role as scavengers, livestock will probably

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[231] [1] The average stock-owning household may claim ownership of twenty fowl, two goats, five pigs, four cattle and one horse (Table 15). No individual household in the survey completely owned this number of animals, due to combination ownership. However, only five percent of the surveyed households owned no stock of any type.

237 TABLE 17.--Approximate Soil Nutrients Per Ton of Manure.

	Nitrogen (N) lb.	Phosphoric Acid ($P_2 O_5$) lb.	Potash (K_2O) lb.
Horse	13.2	5.1	12.1
Cow	11.4	3.1	9.9
Pig	9.9	6.7	9.3
Sheep	115.8	6.7	18.0
Hen	21.0	16.4	10.2

SOURCE: D. Acker, Animal Science and Industry (Englewood Cliffs, New Jersey: Prentice-Hall, 1971.

231 remain most important as an instrument within the Tongan social structure.

Cash Cropping

241 The crops grown primarily for the international export
245 market are coconuts and bananas, although vanilla, melons, fruits and vegetables are also produced in less significant quantities. Survey results, substantiated by personal observations, indicated that most landholdings are at least partially planted with coconut palms, while many 'apis of Ha'apai and Vava'u are totally
241 planted in palms. As the desire or necessity for cash income increases, a greater proportion of the typical 'api will be planted in some type of cash crop.

245 Coconut surpluses, beyond the needs of the family, are usually
439 sold as copra to the Tonga Copra Board. Bananas in surplus are sold

439 to the Tonga Produce Board. The Produce Board also handles the
[245] export of vegetables, melons and miscellaneous fruit and agricul-
[241] tural production directed to the international market.

241 Cash cropping, as mentioned previously, consists mainly of two broad categories: long- and short-term production. In addition, each may further be classified as either for domestic or international sale, although short-term croppings (i.e., vegetables, fruit, and melons) are usually domestically sold and long-term (i.e., coconut products and bananas) are international export items.

Cash cropping remains largely in the hands of Tongan officials, with only a few exceptions, including church plantations. The European contribution to this agricultural component is decreasing as leases expire and are not renewed.

439 Coconuts, copra, and other coconut products are the major
245 cash crop of the Kingdom, representing as much as 85 percent of
245 total agricultural exports (Table 18).A Survey responses indicated
434 that all landholders rely upon the sale of copra for at least a
portion of the household cash income. While statistics from the Department of Agriculture evidenced that the majority of coconut sales originate on Tongatapu, survey data revealed that the proportion of total household income, earned from coconut production, is
241 greatest in Ha'apai. The fact that Ha'apai soils are often
[245] not ideally suitable for large scale production of other cash crops, such as bananas, may represent an explanation for this apparent contradiction. Also, in areas of high population density, such as Ha'apai, a smaller proportion of land can be allocated to

A[See Category 439, p. 103—Analyst.]

[TEXT CONTINUED ON PAGE 104]

241 [245] the cultivation of cash crops. Coconut palms, being relatively
independent of the agricultural planting cycle, are a logical choice
for farmers engaged in cash cropping in densely populated areas.

245 In addition to being the major cash crop export, the coconut palm is also invaluable to the Tongan as a building material and a source of food and drink. However, until land tenure is secure, many farmers are reluctant to enter large scale copra production.
241 Interviewed farmers also expressed reluctance to mix the cultivation
245 of food crops and large scale palm growth, because the shade from
palms supposedly reduces the yield from food plants. Frequently, farmers eliminate all palm growth from small, scattered portions of their allotments, reserving these areas entirely for food crop production.

245 The frequency with which households collect coconuts and pro-
461 duce copra varies considerably. Survey informants indicated col-
245 lections every week, to once per month. In copra production, the
coconuts are collected and usually transported to a central location, frequently the area of residency on an allotment. Here the nuts are split and placed in the sun to partially dry (Plate 11).A Later, the flesh is scooped out, dried thoroughly in the sun, and bagged
[372] for sale. Occasionally a crude kiln drying shed is used to dry the
flesh, in which the heat is supplied by a fire beneath the shed,
[592] fed by discarded coconut husks and shells (Plate 12).B The produc-
[462] tion of copra usually involves the entire family, with men collect-
[85] ing and splitting the nuts, women extracting the flesh, and small
children guarding the sun-drying copra from dogs and pigs. The

A, B [Due to poor quality of originals, plates have not been marked for a Category--Analyst.]

[TEXT CONTINUED ON PAGE 106]

434 (This concept, which is becoming more notable in all segments of
178 Tongan population, is analyzed within the following chapters.)

● 241 In summary, while many aspects of Tongan agriculture have
178 remained basically unchanged through history, there have been
several significant alterations with respect to population growth,
178 land distribution and cropping practices. The most significant of
434 these changes has been the development of cash cropping and the
[241] subsequent rise in purchasing power of the average Tongan farmer.
[439] An indication of these alterations is the increased incidence of
[262] material items within the household, plus reliance upon imported food
products, such as tinned meat, fish, bread and sugar.

245 The continually good market for copra and coconut products
241 has resulted in many 'apis being planted almost entirely with palms,
[178] and less production of traditional foodstuffs. In addition, in
densely populated areas where food crops are interplanted with palms,
the competition for sunlight, soil nutrients, and moisture insures
significantly lower yields from food plants.

178 Low production yields associated with decreases in soil
241 fertility are frequently the result of the shift to a more continuous exploitative cropping system. This change is stimulated by the
178 Tongan farmer's desire for increased cash income, and by increasing
241 population pressure on land available for cultivation. This popu-
161 lation pressure is intensified by the migration of individuals to
Tongatapu from the other island groups, especially Ha'apai. The
Tongan situation is becoming increasingly intensive, with often a
crop/fallow period ratio of one to one, and a supported population

241/ density in excess of 600 persons per square mile, in some regions.
178 Surveys determining fallow periods evidenced a marked decrease in
161 fallow time in Ha'apai and densely settled portions of Tongatapu,
241/ and a subsequent lengthening of the cropping cycle. In many cases, cropping is continuous, considering the frequent practice of sparsely planting fallow acreage with tubers.

241 The use of fertilizers necessary in offsetting the nutrient
242 depleting effect of intensive cropping is not financially feasible nor understood by the typical Tongan farmer. The issue of maintaining soil fertility is of critical concern to the few agricultural and soil technicians in Tonga. However, owing to prohibitive cost, scarcity, and lack of knowledge, it is expected that most Tongan farmers will continue to rely upon the fallow system for replenishing soil nutrients.

241, The problems of soil fertility and land availability in
244
178 Tonga have resulted in the increased cultivation and household
[262] reliance upon taro and cassava as major food staples.[1] Cassava represents the best example of the variation in food cropping
241/ brought about by increasing pressure upon the land. In a status
244 ranking of tubers grown in Tonga, cassava is found at or near the bottom. However, even though the least desirable, cassava is the

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[1] Both tubers were introduced into Tonga in the nineteenth century, although a variety of taro was cultivated in Tonga prior to that period. The introduced taro varieties are more tolerant of dry, upland conditions, as opposed to the marsh requirements of the earlier species. Today most taro is cultivated without a marsh environment. Cassava is an introduced food crop. Of the cultivated tubers, cassava is lowest in status and its increasing cultivation is due to necessity, rather than any growth in popularity.

241 244 easiest to cultivate, plant or harvest, requiring very little care for a high yield. In addition, of the tubers grown in Tonga, cassava is the least demanding upon soil fertility and is the most tolerant of drought. Survey data indicated that cassava is cultivated the most in the densely populated portions of the islands or in those areas where land availability is limited.

262 146 The increasing reliance upon cassava presents a potential nutritionally detrimental situation. Cassava as food is nutritionally unbalanced in several ways, particularly in protein content. Protein derived from cassava is deficient in the sulfur essential amino acids. Therefore, most cassava protein, low in total value to begin with, is unavailable for use by the human body. The consumption of cassava, in lieu of more nutritionally balanced foods, could result in protein deficiency in several segments of Tongan population, including pregnant women and preschool children.

241 244 [178] The increase in cassava cultivation has seemingly brought about a corresponding decrease in the cultivation of yams. Though the yam is the most prestigious of the major tubers, yams are a much more labor intensive crop than cassava, requiring intensive soil preparation, careful planting, weeding and harvesting. In addition, yams are more demanding on soil fertility, and with increasing cash cropping and decreasing land availability, less land is suitable for yam cultivation. The trend toward decreasing fallow periods does not permit sufficient soil nutrient accumulation for favorable yam growing conditions.

241 423 Land tenure is also related to changes in the Tongan agricultural system. The land tenure system in Tonga is the cause of considerable social dissatisfaction and economic inefficiency. Farmers are reluctant to invest significant quantities of labor or capital in land, until secure tenure has been established, thereby [565] reducing productivity levels. Since more than 50 percent of Tonga's tillable acreage is owned by royalty or nobility, the land available for crop production is severely limited. It is a general opinion in Tonga that land shortage is the major restraint upon improving agricultural productivity. However, land shortage in absolute terms is not the case. The shortage of acreage is in that which is made available to Tongan farmers by the nobility and royalty.

241 Tongan social and cultural traditions are also an influential force upon agriculture. For example, many surveyed farmers expressed a reluctance to increase production because of the corresponding increase in social obligations which would offset the [426] effort. This custom of "borrowing" cash or crops, with infrequent repayment, has caused many farmers to purposely curtail production. In addition, growing urbanization has had an enormous impact upon Tongan agriculture.

241 433 178 Despite the above, Tongan economy remains tied to agriculture. This fact is unlikely to change in the foreseeable future, despite continuing population pressure, alterations in cropping patterns, and the increasing consumption of imported foodstuffs.

241 Personal observations, survey data and research indicate that the
178 agricultural future of Tonga will be one of continued drain upon
H33 soil fertility, decreasing production rates per man hour in food
crop cultivation, and increasing reliance upon cash cropping to
satisfy the needs of an agrarian population.

000
369 areas and in amusement facilities. This situation A is often blamed
674 for the rapid rise in crime in Nuku'alofa. Burglary is the most
[178] frequent offense, although the incidence of fighting, prostitution,
and petty theft have recently evidenced significant increases.
Subsequently, this continuous migration of young Tongans has become
a concern at all levels of government in the Kingdom (Report of the Department of Justice 1973).

369 The most influential urban factor attracting rural indi-
166 viduals to Nuku'alofa is the opportunity of improved education.
871 Nearly all of the secondary schools are on Tongatapu and most of
[368] these are in Nuku'alofa. The fact that substantial education is
usually unnecessary for village life, and that there are few opportunities for gaining urban employment, is of little consequence in deterring this desire. As mentioned previously, families often entirely abandon their village residence in order to move into
166 the city and acquire a better education for the children. Fre-
[871] quently, this migration is intended to be temporary. However, as
the older children finish their education, the younger children begin. In addition, the older children often marry and, as a result,
871 permanent residency is established. Tongans perceive education to
555 be symbolic of prestige, even though the knowledge gained will be
put to little use. Educational attainment is considered to be the simplest and most direct means to upward social movement.

166 The rural factors contributing to expanded urbanization are
241 almost entirely related to the system of land tenure and agriculture.
[369] Pressure of population upon land resources has been shown to exist
[161]

A [i.e., the high incidence of unemployment among youths in urban areas.--Analyst.]

166
241 in varying degrees throughout the Kingdom, though it is greatest
161 in Ha'apai and portions of western Tongatapu. As population pressure
increases and maintaining a living through agriculture means becomes
more difficult, migration from these regions can be anticipated.
241 Related to this issue are the decreasing agricultural yields result-
ing from lower fertility levels, shorter fallowing periods and the
[166] expansion of cash cropping. When cash cropping profits become sub-
stantial enough to support a given household, independent of large
scale home food production, the motivation for migrating to an urban
area is high. Such migration results in absentee landholding and the
utilization of friends or relatives to harvest the cash crop. Thus,
agricultural acreage is removed from domestic food production, and
369 allocated to cash crop production. The cash earnings are used to
511 maintain the household in the urban environment. Consequently, the
family experiences an increased dependency upon a greater propor-
tion of foreign imports in order to satisfy its food and material
369 needs. The effects of this are currently being felt in Nuku'alofa,
433 a direct result of too many urban consumers being served by too few
[457] rural producers. The Kingdom is operating under an increasing trade
deficit in order to supplement native food production with imports
(Table 20).A Eventually, this will necessitate major adjustments in
the national economic profile.

369 Migrating to an urban area such as Nuku'alofa often increases
554 the social position of the household. Urban living is perceived as
[166] being synonymous with an improved standard of living, while agricul-
tural employment is considered to be a lower prestige occupation.

A[See Category 457, p. 124--Analyst.]

[TEXT CONTINUED ON PAGE 125]

369
596 employment is found or a means of establishing a new urban household
593 is secured. At this point division is accomplished and the newly
591 urbanized family becomes another potential host to migrating relatives.
166 This system with its chain nature of migratory urbanization
was observed in many of the surveyed urban households.

369 Thus, migration to urban areas has been in response to
166 economic and social pressures for education, employment and the
prestige of urban living, plus a lessening attachment to the traditional
village life style. Therefore, migratory trends are
indicative of cultural and economic changes in Tonga, which are
expected to continue.

436 With the development of cash cropping and a greater dependency
178 being placed upon a cash economy, money has become an essential
to the average Tongan. Not only is it needed to meet social obligations
(i.e., education, taxes and church contributions) but it is
also increasingly important in satisfying the basic subsistence
178 needs of both rural and urban residents. The desire to increase
241 cash income has altered the agricultural pattern of the nation
182 from traditional to cash cropping, thus eliminating a dependency
upon the land for production of food and material necessities.
[458] These changes have been facilitated by fluctuations in post-World
[73] War II copra prices, and such natural disasters as drought and
hurricanes.

369 While Nuku'alofa does not offer full-time employment to
166 most migrants, there remains the possibility for part-time labor,
[464] sufficient to meet the minimum cash requirements. Thus, urban

121
369 urban areas, (2) displaced individuals migrating due to increased
161 population pressure on agricultural land, and (3) migration of
166 those rural individuals with sufficient income from cash cropping
178 enterprises. (The above is summarized within Figure 2).

178 Despite increases in the absolute quantity of domestic food
121 production, research results indicated that population growth more
241 than nullifies these gains. This situation is aggravated by the
withdrawal of acreage from domestic food production resultant from
(1) expanded cash cropping, and (2) increasing absentee landholding.
[439] The ensuing gap between population and domestic food needs
requires that Tonga import large quantities of foodstuffs (Table 20).[A]

121 Further investigation revealed that the consequences of
178 urbanization in Tonga are (1) decreased domestic food production
146 per capita, and (2) retarded physical development of preschool
369 children most likely due to inadequate dietary quality, as shown
121 in Table 21, and Table 28 (p.188).[B] However, in order to strengthen
the reliability of the preceding hypotheses, it is recommended that
they be tested in relation to alternative societies.

Implications

241 The Tongan social structure and systems of land tenure and agriculture, in combination with expanding urbanization, require that Tongan governmental officials realize the vital role of agriculture in the Tongan economy. To date, the Kingdom lacks any other alternative resources. Thus, care must be taken to stabilize and revitalize agriculture and domestic food production.

A [See Category 457, p. 124--Analyst.]
B [See Category 146, p. 136 and 188--Analyst.]

Recommendations

000 Recommendations following this research might take several forms. The most immediate need involves the complete redistribution [511] of land now being held by the nobility or royal family. Further, allotment sizes of four acres appear able to provide the needs of the average family. Therefore, division of existing eight and one-quarter acre or larger holdings into four-acre units seems advisable. It is fully recognized that the existing political and social structure of the Kingdom make implementation of such recommendations difficult. More realistically, the following may be offered with some expectation for immediate or future implementation.

●[241] 1. Inasmuch as pest damage to Tongan agricultural production amounts to 20 percent of exportable cropping, newer forms of effective pest control are appropriate. The rat, as the most [241] destructive, should receive first priority. Reducing foliage cover and using protective measures for crops has been shown ineffective in the Tongan situation. Therefore, newer approaches of research are advisable, including disruption of the rodent's feeding base and the possible introduction of predators, i.e., viral or mammalian. Such control measures, if successful, would benefit not only the Tongan situation, but other Pacific islands as well.

2. Owing to the already serious population maldistribution, it is advisable that immediate action be taken by the Tongan government leading to the strengthening of rural activities, resettlement or planned settlement of migrating Tongans, and the discouragement of

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134 agricultural necessity, rich soil. Except on the volcanic islands, the soils are predominantly clay loams derived from coral limestones and weathered volcanic ash material. The eastern islands, which contain the bulk of population and production activity, are close enough to the volcanic chain to the West to have received numerous coatings of volcanic ash through geologic history. The result is the presence of a much more fertile soil than is normally found in a coral island environment (Kennedy 1961, p. 66).

The soils of the islands may be seen as two general layers (Plate 13).A The lower layer is compr'sed of older volcanic ash material which has undergone little weathering but shows evidence of water action, i.e., percolation and some leaching. The clay content, though as high as 90 percent, does not prevent water passage or pose any significant potential for hardpan or claypan development. The upper level (actually a topsoil layer of up to three feet in depth) consists of approximately 60 percent clay, and is also weathered volcanic ash material. An examination showed the soil to have an excellent structure with particle size generally in the 1-2 cm. range. The structure is also strong as evidenced by its friable character. However, owing to the average particle size and generally young appearance of the soils in profiles examined, it remains very permeable and possesses few water retention qualities (Hougland 1974).

Soil mineral characteristics are also generally favorable. Those examined where high in calcium, magnesium, and potassium.
[241] However, nitrogen deficiency in some areas may be noted. This is

A[Due to poor quality of original, plate has not been marked for a Category--Analyst.]

[TEXT CONTINUED ON PAGE 169]

134 likely owing to the combination of a number of factors, both
241 physical and cultural, not the least of which are rainfall, general
weed and grass growth and the custom of burning acreage prior to
planting.

The key to the maintenance of soil fertility in the islands
under the present pattern of cultivation is the system of "bush
fallowing" and close planting of crops which results in the reten-
tion of some humus in the soil (Great Britain Colonial Office
134 1956-64, p. 20). This, along with the soil characteristics described,
make some minor leaching and nitrogen depletion the major problems
regarding the soil's physical properties.

137 Vegetation is luxuriant and includes most typical tropical
types with a number of superimposed imported varieties, particularly
food producing plants. In addition to introduced food crops, an
undesirable feature of plant life which has been introduced is
weeds which pose problems for agriculture as well as being a
bother to the human element (Pacific Islands, Vol. III, 1944, p. 37).
The most significant of these are the grasses, including Nut,
Guinea and Johnson varieties (Jansen 1973).

311 Forestry potential presents perhaps the most valuable aspect
313 of natural vegetation aside from food production. The total area of
all forest lands comprises approximately 26,000 acres which are con-
[423] fined to the islands of 'Eua and Vava'u. This resource is owned and
[655] managed by the government. However, it is presently of little
commercial value due to the problems of resource inaccessibility and
313 transportation of the milled production. Most activity in this

313 sector is directed to the construction of banana cases and local 313 housing construction. It should be noted, however, that since 654 1954, the Tongan Department of Agriculture has begun a small scale reforestation program designed to determine the feasibility of developing this as an exportable economic resource (Great Britain Colonial Office 1956-64, p. 22).

241 Other species of vegetation which are culturally important to Tongans are those which produce the majority of the nation's food. These include the breadfruit, coconut, banana and various root crops.

433 Until recently, Tonga has had the distinction of being one of the few Pacific territories which could be called a self-supporting community (Harris 1966, p. 127). Economically, Tonga is essentially an agricultural country. There are no notable developed mineral resources and the only industry consists of minor processing 439 facilities for agricultural products. Economic necessities from outside the islands are paid for by exports of bananas and coconut 457 products in most cases. Until recently, Tonga enjoyed a favorable balance of trade. However, this balance has tended to reverse in the past few years with the tendency toward larger and larger deficits as shown in Table 20.^A

511 The population in the past has been in the position to plant [438] a large portion of their food requirements. Any cash requirements were usually provided through the sale of bananas and coconuts to regional collection points (Great Britain Colonial Office 1956-64, 511 178 p. 11). This subsistence system is rapidly altering due to increasing

^A[See Category 457, p. 124--Analyst.]